Sept. 10, 1946. J. O. PARR, JR 2,407,442

SEPARATION OF BLASTING CIRCUIT LEADS

Filed Jan. 29, 1943

FIG. 1.

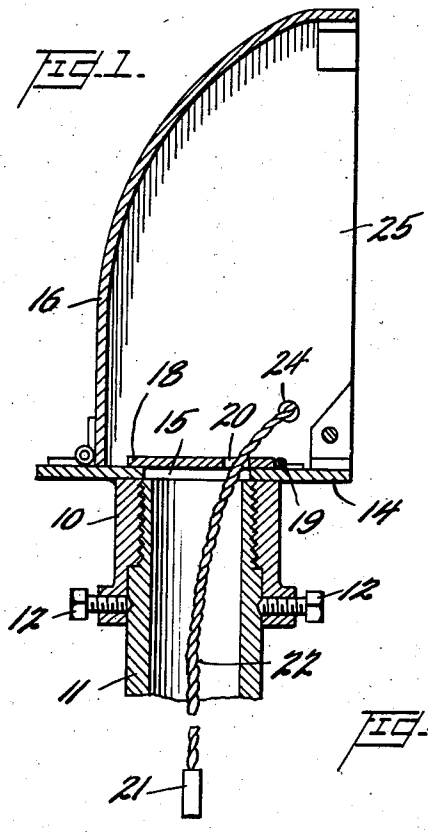


FIG. 2.

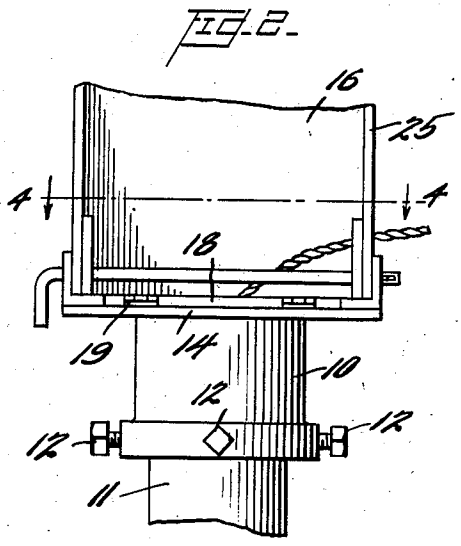


FIG. 4.

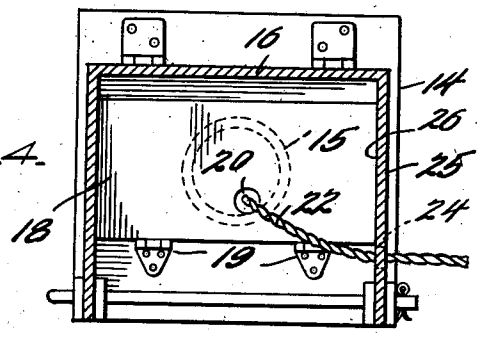


FIG. 3.

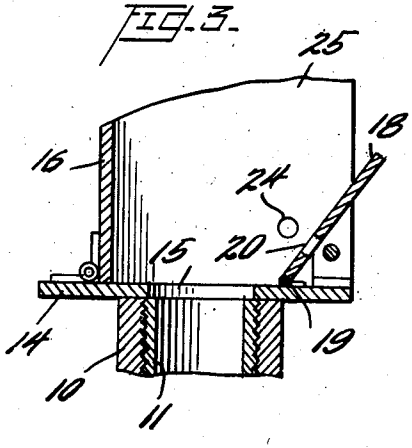
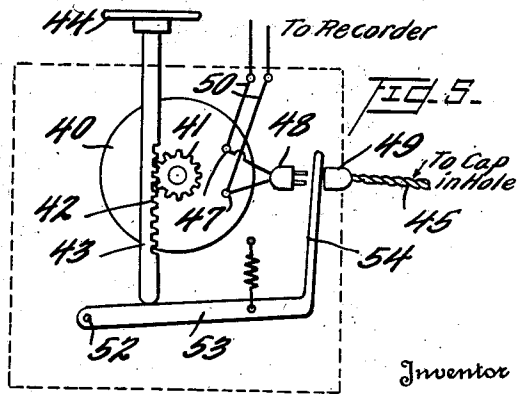


FIG. 5.



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SEPARATION OF BLASTING CIRCUIT LEADS

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7 Claims. (Cl. 102—22)

1

This invention relates to methods of and apparatus for separating the electric conductors, which connect an electrically ignited blasting cap with the source of blasting current, at substantially the instant of firing the shot.

It is a general object of the present invention to provide novel methods of and apparatus for entirely disconnecting the cap leads, in a blasting circuit, from the source of current supply for firing the cap, and from any recording equipment which may be associated with the same for making records of the shot firing time.

More particularly it is an object of the invention to provide, in one embodiment thereof, an attachment for the deflector arranged at the casing head of a shot hole, whereby the cap conductors are severed as a result of the ejection of gases and liquids following the firing of the shot.

In another embodiment of the invention it is an object to disconnect the cap conductors from any other electrical apparatus with which they may have been associated for providing the operating current or recording the instant of breakage of the bridge wire in the cap, just as soon as the shot has been fired and before the conductors can be blown sufficiently far from the hole to contact with any high voltage lines.

An important feature of the invention resides in the use of means to completely electrically isolate the cap and at least the portion of its conductors which are blown from the shot hole by the force of the explosion, from any electrical equipment and personnel so that no injury or damage can result if the cap conductors are blown into contact with high voltage lines.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and following specification, wherein are disclosed exemplary embodiments of the invention with the understanding that such changes, combinations thereof, and modifications may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawing:

Figure 1 is a central vertical section of a combined deflector and cap conductor separator shown mounted on the top of a casing in a shot hole;

Figure 2 is a fragmentary front elevation of the same;

Figure 3 is a view similar to Figure 1, showing the door in the opened position;

Figure 4 is a horizontal section taken on line 4—4 of Figure 2 with the door in closed position; and

Figure 5 is a schematic showing of an embodiment wherein the conductors are separated at the blasting machine under the action of the manual means for operating the same.

2

In the firing of "shots" in connection with seismic prospecting and similar work, it is often essential to locate the shot holes adjacent to structures, orchards, grain fields, and the like, and where substantial charges of explosive are fired which have been tamped by water filling the hole, much damage is often done by the ejected mud forced up by the explosion and blown about by the wind. In accordance with a copending application filed in the names of Rogers, Rudolph and Crawford, Serial No. 423,210, for Spray deflectors for shot holes, which issued Oct. 30, 1945 as Patent No. 2,387,770, there are disclosed several embodiments of an invention for deflecting or reducing the amount of spray so that it can be controlled or directed away from objects which might be damaged thereby.

All such shots are fired electrically, and for the purpose a pair of conductors must lead down the hole, which is often cased to permit it to be used several times or for other reasons. Such conductors lead to the blasting machine and also to the recording apparatus, enabling a record to be made of the instant of firing the shot. The shot holes are often arranged adjacent to or directly beneath high voltage power lines or service lines leading to dwellings or other buildings, and in spite of the effectiveness of the spray deflectors, these conductors are often ejected violently from the shot hole and may be thrown over power lines, not only subjecting the operator of the blasting machine to the danger of injury or electrocution, but oftentimes ruining the recording apparatus.

In accordance with the present invention therefore, it is proposed to associate with one form of deflector, as illustrated in the above application, means for automatically severing the conductors at the mouth of the casing by the action of the material being ejected from the casing. In another embodiment which is intended primarily for use in uncased shot holes, a means is associated with the blasting machine for disconnecting the conductors, leading to the cap from any other circuits with which they may have been connected, an instant subsequent to the firing of the shot so that the record may be completed but the conductors disconnected before the cap wires can be blown out

of the hole. This offers the same protection to the operators and equipment as the first embodiment.

In the form of the invention illustrated in Figures 1 to 4 inclusive, the deflector comprises a fitting 10 shown as attached to the upper end of a casing pipe 11 by both threads and set screws 12. Either formed integral or suitably welded to the upper end of the fitting is a horizontal plate 14 having the central opening 15 in alignment with and of substantially the same size as the bore of the casing. A deflector plate 16 is attached adjacent one edge of the horizontal plate and is curved over the opening 15 to receive, disperse, and deflect any effluent from the casing.

For the purpose of the present invention no further disclosure of the construction of the deflector is necessary. To modify the same to automatically sever the cap wires, the hole 15 is provided with a movable cover or door 18 in the form of a simple rectangular metal plate which may be hinged as at 19 to the horizontal plate 14. The door normally lies in a position to close the opening to the casing as clearly seen in Figure 1. It is provided with an aperture 20 large enough to pass the cap 21 therethrough, followed by the leads 22 to which the same is attached. It might be unnecessary to provide this aperture sufficiently large for the cap if the same is first loaded with the explosive material, lowered in the hole by its leads 22, and the latter then fed upwardly through the opening 20 while the door is still open. The leads are then passed out through an opening 24 in one of the side walls 25 of the deflector or in a short side wall provided for the purpose in the event that the original deflector is not so equipped, and are connected to the blasting machine or other source of firing current and to the recording apparatus.

As shown in Figure 4, the hole 24 is offset horizontally from the closed position of the plate and the lateral edge 26 of this plate is adjusted to be closely adjacent the side wall plate 25 and is adequately sharpened to cooperate with the hole edge and form what might be considered a shears, the edge of the hole 24 serving as a ledger plate and the movable door acting as the cutting blade.

When the shot is ready to be fired, the conditions are as illustrated in Figure 1 with the door closed and the conductors passing out through the door hole 20 and then through the side wall hole 24 to the blasting machine and the recording apparatus, all preferably being connected in the manner illustrated in Figure 5. When the shot is fired, the record of the breaking of the cap bridge wire is instantly made. The explosion pressure builds up rapidly in the hole and mixed gases, liquids and mud are violently ejected from the same, forcing the door open with considerable power, moving the sharpened edge 26 thereof by the hole 24 to the position shown in Figure 3, thus severing the surface conductors from those in the casing and connected to the cap so that even should the latter escape being caught by the deflector plate, they can do no damage to the personnel or equipment, even though thrown over high voltage lines.

In the form of the invention illustrated in Figure 5, intended for use where no casing is available for supporting cap wire severing means, the blasting machine is modified as illustrated. Such a blasting machine comprises a direct current generator 40 having a pinion 41 mounted on the shaft and adapted to engage with teeth 42 on a rack bar 43 vertically mounted in the casing as a plunger and equipped with a T-handle 44 to be violently depressed by the operator to speed up the generator and build up sufficient current to fire the cap in the customary manner.

In this case the cap leads 45 are connected to the terminals 47 of the generator through a suitable separable connector including parts 48 and 49, one of which is fixed to the casing of the generator. Conductors 50 also extend from the terminals 47 to the recording equipment. These are shown as connected in shunt to the cap conductors, but under certain conditions there might be a series arrangement of the cap, the blasting machine, and the recorder. The exact arrangement of this circuit has no bearing on the claimed part of this invention.

In order to insure the separation of the connector parts 48 and 49, a bell-crank lever is pivoted at 52 in the generator casing and has a substantially horizontal arm 53 positioned to be engaged and depressed by the plunger 43, near the lower end of its stroke, after the generator has built up a sufficient voltage to fire the cap. The other arm 54 of the bell-crank lever is normally substantially vertical and its extreme end projects between the two portions of the separable connector without separating them. Depression of the part 53 moves the vertical arm 54 to the right and separates the two parts of the connector, effectively severing the cap leads from the rest of the equipment almost instantly after the firing, so that no damage may be done to the operator or the equipment. A common plug type separable connector has been shown for simplicity, but it will be obvious that any suitable double pole switch or device of that nature might be used for the purpose, operated by the same type of bell-crank lever. The showing is entirely schematic and no limitations, except as expressed in the claims, are intended. It will be clear that a simple shear mechanism could sever the conductors under the control of the lever 54 if it were desired to renew them at this position each time a shot was fired. Those portions of the conductor which enter the hole can well be severed as in the first embodiment, since they are seldom fit to be re-used after being subjected to the punishment of being blown from the hole by the shot.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A deflector of the type described for use with a cased shot hole and electrically fired cap, in combination, a hollow fitting, means to secure said fitting over the upper end of the casing, said fitting having a flat base plate in a plane substantially at right angles to the casing axis and apertured in alignment therewith, a deflector plate secured to said base plate near one edge thereof and extending over the aperture, side plates secured to said base plate and extending vertically upwardly to meet the deflector plate, a cap conductor passage in one of said side plates near the base plate, and a door plate hinged to the base plate, normally covering the aperture and having a small cap conductor passage in register therewith, one edge of said door plate being sharpened and positioned to cooperate with the side plate conductor passage to cut the conductors passing therethrough when the door plate is lifted by spray and gases issuing from the casing following an explosion.

2. In a device of the type described, in combination, a fitting constructed to be secured to the top of a shot hole casing and having a pas-

sage therethrough in alignment with the casing hole, a door plate hinged to said fitting to normally close the passage, a perforation in the door plate for the cap conductor wires, a ledger plate positioned cooperatively with one edge of said door plate and perforated above the closed position of the same for the same conductors, whereby the door plate will sever the conductors as it opens under the force of issuing gases and spray from an explosion in the shot hole.

3. A deflector assembly for use with cased shot holes comprising a deflector plate, a fitting to mount the same on the casing in a position to deflect laterally all material issuing from the casing, and a severing device beneath the deflector to sever all wires entering the casing under the force of the explosion and before the issuing material strikes the deflector.

4. A line severing device for the conductor wires leading down a cased shot hole to a detonating cap comprising, in combination, a fitting adapted to be received over and secured to the upper end of the casing, shear mechanism carried by said fitting and having a movable blade, means to position the conductor wires for severing when the said blade is moved, and means responsive to explosion in said hole to move said blade.

5. In electric shot firing apparatus of the type described, comprising an electric percussion cap having a bridge wire, a source of current for firing said cap, recording apparatus for making a record of the instant of firing the cap as indicated by the breaking of the bridge wire therein,

and conductors leading from the said source to the recording apparatus, the combination with conductors leading from the source to the cap in a shot hole, of a severing device mounted at the top of the shot hole and positioned to be moved by the force of the explosion, said device being arranged to sever both cap conductors when so moved.

6. In electric shot firing apparatus of the type described, comprising an electric percussion cap having a bridge wire, a source of current for firing said cap, recording apparatus for making a record of the instant of firing the cap as indicated by the breaking of the bridge wire therein, and conductors leading from the said source to the recording apparatus, the combination with conductors leading from the source to the cap in a shot hole, of a gas pressure actuated circuit opener associated with both of said cap conductors, said circuit opener being positioned to be actuated by the blast from said hole to open the circuit in both of said cap conductors.

7. A line severing device for the conductor wires leading down a shot hole to a detonating cap, comprising, in combination, a fitting adapted to be secured over the shot hole, shear mechanism carried by said fitting and having a movable blade, means to position the conductor wires for severing when the said blade is moved, and means responsive to explosion in said hole to move said blade.

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