June 17, 1930. J. A. MORRISON ET AL 1,764,222

WELL SHOOTING DEVICE

Filed Sept. 15, 1923

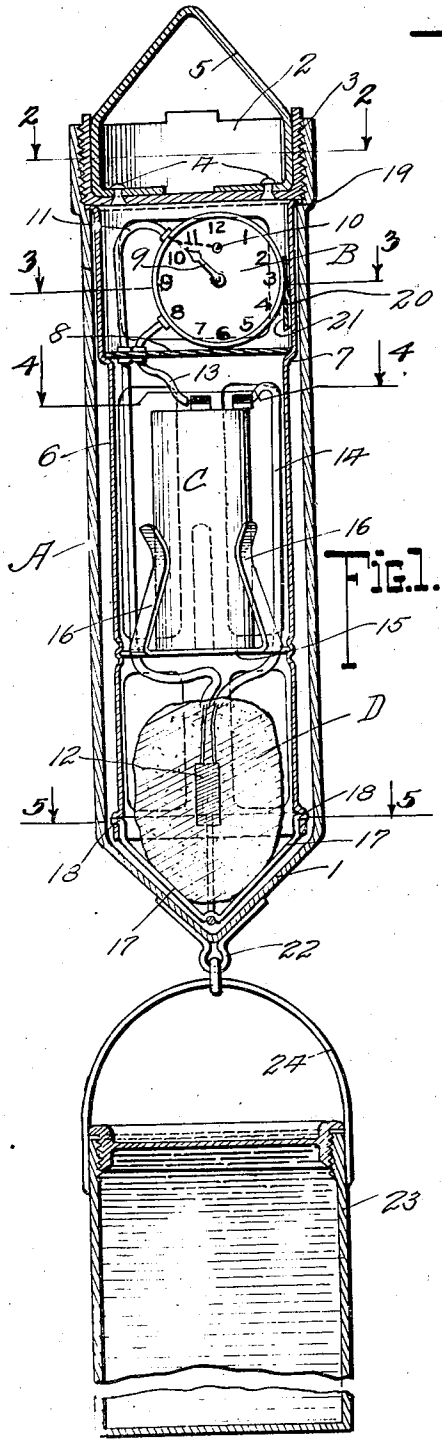


Fig. 1.

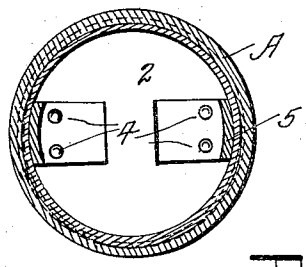


Fig. 2.

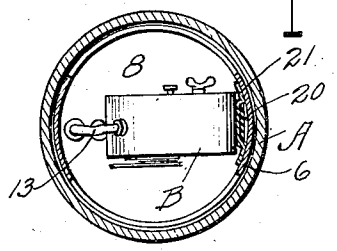


Fig. 3.

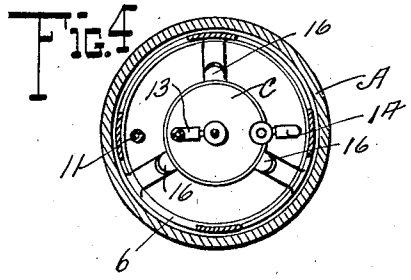


Fig. 4.

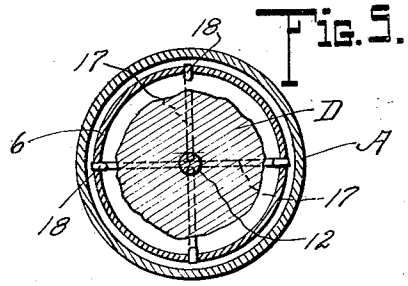


Fig. 5.

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UNITED STATES PATENT OFFICE

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WELL-SHOOTING DEVICE

Application filed September 15, 1923. Serial No. 662,962.

In the drilling of oil wells a common practice in most oil fields is to shoot the pay sand of the well after it has been drilled, by employing a charge of nitro-glycerin or high explosive of a similar character. The object in view is to shatter what is called the pay formation in the vicinity of the hole, so as to thereby increase materially the production of the well.

The aim of this invention has been to produce a comparatively simple device for shooting wells including primarily a time control means which gives rise to special advantages in the operation of the device, as compared with the methods which have been heretofore practiced for the same purpose. The said advantages will be presented more fully after a full understanding of the construction and action of our device is had, upon reference to the following description in conjunction with the annexed drawings in which;

Figure 1 is a vertical sectional view of an oil shooting device embodying the essential features of the invention.

Figure 2 is a sectional view taken about on the line 2—2 of Figure 1.

Figure 3 is a sectional view taken about on the line 3—3 of Figure 1.

Figure 4 is a sectional view taken about on the line 4—4 of Figure 1, illustrating more fully the mounting of the battery in respect to its holding means.

Figure 5 is a sectional view taken about on the line 5—5 of Figure 1, or approximately through the dynamite charge and the exploding cap therein contained.

Referring to the accompanying drawings in which is illustrated one of the embodiments which our invention may take in actual construction, it will be seen that we provide a main elongated container or shell A, which may or may not be tapered toward its lower extremity as at 1, and which is equipped at its upper open end with a head or closure 2. The lower end of this shell, or hollow body of the exploding device, is closed and it is designed that the head or closure 2 shall be applied to the upper end of the shell A in any suitable manner by which may be established an air and water tight connection between these parts. While this head or closure 2 may be bolted onto the shell, should it be desired, we have illustrated it as screwed into the shell, the upper end of the latter having internal screw threads and the closure 2 being equipped with external threads for the purpose stated, as designated at 3.

Affixed to the closure 2 in any substantial way as by rivets 4, or the like, is a rigid bail or loop 5 adapted to be engaged by any suitable tackle such as a grab or hook suspended from a cable or rope by which the exploding device is lowered into the well to its position where it will be exploded or burst for the purpose of shattering the pay formation at the base of the hole drilled.

Within the shell A are contained, the timing device B, an electric spark generating means in the form of the dry battery C, and an initial exploding means consisting of the dynamite charge D.

It is necessary of course, to utilize some convenient method of supporting the parts B, C, and D, in proper relation to each other, and maintaining them in operative positions respecting the shell A by which they are contained. We may employ almost any suitable structure for the above purpose but that illustrated for the purpose of this disclosure of our invention consists of a frame or carrier 6 approximately co-extensive with the length of the shell A, slightly enlarged at its upper portion to form a shoulder 7 on which the shelf 8 is seated.

On the shelf 8 is supported the timing device B which preferably consists of a clock or similar timing means. This clock has the hour hand 9 which constitutes a switch. As the clock B, or timing device, is largely of metal construction, the works thereof form a conductor, electrically speaking, and just beneath the twelfth hour mark of the clock is an insulated contact 10. The contact 10 is insulated from the works of the clock and is connected with the lead or wire 11, which extends to, and is attached suitably to an exploding cap 12 contained within the

charge D of dynamite arranged at the lower portion of the frame 6.

Attached to the casing of the clock or timing device B, is a second lead or wire 13 secured to one of the terminals of the battery C. From the other terminal of the battery C extends a lead or wire 14 which is also connected with the cap 12 in the dynamite charge D.

The battery C is supported by a shelf 15 suitably carried by the frame 6 some distance above the lower end of the latter and just above the dynamite charge D. If desired, the shelf 15 may be equipped with spring fingers 16 to resiliently hold the battery C in proper position so as to prevent shifting about of the battery C in the shell A that might be liable to create disconnection or displacement of the lead wires previously described.

The dynamite D may be contained in any suitable container beneath the shelf 15, and is primarily supported by a wire frame 17 consisting of four arms having lugs 18 to engage in openings at the bottom of the frame 6. The arms 17 may be sprung into or out of engagement with the frame 6 in an obvious manner.

The foregoing sets forth briefly the assemblage of the parts which are contained in the shell A, and it may be observed that the upper end of the frame 6 is equipped with a flange 19 clamped between the closure 2 and a shoulder on the shell or casing A, this arrangement providing against looseness and shifting around of the frame 6 within the shell A if desired. In order to render the container or shell A additionally water tight and air tight, a packing may be interposed between the parts 2 and 19, for the matter of water tightness is of importance in the practical use of the device. Likewise if desired, the clock or timing means B may be formed with a projection 20 to engage in a loop or clip 21 attached to the side of the frame 6 as best seen in Figure 3.

Secured to the lower extremity of the shell or casing A, is a loop 22 constituting a hanger enabling the attachment to the shell A at said extremity of a charge containing vessel 23, which holds the main explosive, the discharge of which causes the shattering of the pay formation in the hole.

We preferably employ nitro-glycerin for this purpose, the same being commonly used in well drilling operations, for the well exploding function. The vessel 23 may be suspended from the loop 22 by a bail 24 or any suitable connection intermediate the parts 22 and 24.

The frame 6 is designed to have openings in its sides to facilitate the emplacement of the various parts B, C, and D, of the exploding apparatus.

We do not wish to be limited to the special construction of the frame as described, as a number of similar expedients as regards this feature may be employed.

With the above understanding of the construction of our invention, its operation under actual conditions of service may now be set forth.

After the drilling of the well has been completed, the exploding device as above set forth, is placed in the well and lowered. The clock B will previously have been set so that after the lapse of a predetermined time, say an hour, or two hours, or whatever time is required for the specific operation, the hour hand 9 will come into contact with the contact member 10. In this manner a closing of the circuit, which includes the wires previously described, the battery C and the fulminate cap 12, will be effected, and the cap 12 will be ignited causing an explosion of the dynamite charge D, which is merely employed as an initial explosive for the setting off of the shattering charge of nitroglycerin in the vessel 23.

We are aware, of course, of the common use at present in oil well operations of the jack squib as the well exploding means. However, we are cognizant that under actual conditions of service the dropping of the jack squib into the well at times is disadvantageous because resulting occasionally in a failure of explosion, and owing to the fact that under certain conditions where the pay sand is proximate to the casing fluid tamping on top of the squib cannot be performed. Under the latter conditions large torpedoes cannot be used with success whereas our present invention would be very suitable as the explosive charge may be as large as desired for obvious reasons.

Other methods are used for exploding wells also, but are susceptible of either defective action, premature explosion with possible disastrous results, or involve other difficult features rendering them not as advantageous as the present exploding device we have devised. With our device the possibility of premature discharge is wholly obviated and there is, therefore, no liability of creating a dangerous condition for workers at the well, or the entire loss of the well or great damage thereto.

In many instances, it is necessary to bail the oil or water out of a well before it is shot. If this is not done the column of fluid falling back into the well after the explosion will break the casing. With our present exploding device, the hole is bailed out first after which, and as the final operation, our device is lowered into place. As soon as the bailing is commenced however, caving usually takes place below the casing and with present methods this caving interferes with the shooting of the well. We may, however, lower our exploder into the hole with

the time clock set several hours ahead, prior to the bailing, and then this allows plenty of time in which the bailing out of the water or oil may take place. The explosion will follow at the regular time set.

Another condition arises in that occasionally the shooting of wells already flowing by heads must be done for production increase results. The heads or peak flows take place of course, at periodical times, of course at such wells and it will be apparent that between such times we are enabled to lower our exploder in place, set to explode at the proper interval for effective shooting of the hole.

For the reasons set forth, in view of our practical knowledge of well drilling operations, we believe that our exploding device accomplishes results and affords advantages not possesed by methods now in common use.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is—

1. In a well exploding device, the combination with a casing, having a removable water tight closure, of a frame insertable into said shell and comprising supporting parts, and a timing device, battery unit, and exploding charge, co-operatively associated and assembled on the supporting parts of said frame.

2. In a well exploding device, the combination with a casing having a removable water tight closure, of a frame insertable into said shell and comprising supporting parts, a timing device, battery unit, and exploding charge, cooperatively associated and assembled on the supporting parts of said frame, and means exterior to the shell for supporting a main pay sand shattering exploder, and a shattering exploder attached to said last mentioned means.

3. In a well shooting device, in combination a shell, elongated to facilitate entering the same into a well hole, a water tight closure at the upper end of the shell, suspension means applied to said closure, a timing device, battery, and explosive charge assembled in the shell one adjacent to the other, means to support said three parts in the relation specified, and connecting means between said three parts whereby the timing device utilizing the electrical energy of the battery will set off the explosive charge.

4. In a well shooting device, in combination, an elongated shell closed at its lower end and open at its upper end, a water tight closure at said open upper end for closing the same, suspension means at the upper end of the shell, a frame unit within the shell, an explosive charge in said shell containing means for setting off said charge, and a timing device and battery adjacent to said charge for controlling the setting off thereof, and assembled so as to be carried by said frame unit whereby the timing device battery and explosive charge are maintained in proper relation to one another.

5. In a well shooting device, in combination, an exploding unit adapted to be lowered into the well and comprising time controlled means together with an initial exploding charge of relatively small size for creating an initial explosion, all self contained and operable at pre-set time, and a main pay sand shattering exploder carried by said exploding unit exterior thereto and operable by the initial exploder of said unit.

6. In a well shooting device, in combination an exploding unit comprising a casing having a self contained time controlling means, and an associated initial exploder, said unit being water tight and adapted to be pre-set in relation to the time controlling unit to set off the initial exploder whenever desired, and a main sand shattering exploder external to said shell and its self contained features, and adapted to be operated by the explosion of the initial exploder within the shell.

7. In a well shooting device, in combination, an exploding unit consisting of a shell of water tight construction, a time controlling means within said shell, and an initial exploder in said shell operable from said time controlling means, together with a main exploder external to the shell and adapted to be exploded by the initial exploder within the shell.

8. A well shooting device, in combination, a self contained exploding unit consisting of a water tight shell elongated to facilitate entering the same into the hole to be exploded, a pre-settable time controlled initial exploder within said shell, means whereby the shell be lowered into the hole to be shot, and a main exploder suspended from the shell external thereto and operable by the exploding of the initial exploder within the shell.

9. A well shooting device, in combination a self contained exploding unit consisting of a water tight shell elongated to facilitate entering the same into the hole to be exploded, a pre-settable time controlled initial exploder within said shell, means whereby the shell may be lowered into the hole to be shot, and a main exploder suspended from the shell external thereto and operable by the exploding of the initial exploder within the shell, the shell and the main exploder being in alignment and connected so as to be lowered together within the hole to be shot.

10. A well shooting device comprising an explosive receiving shell, a timer casing telescoping within the shell, an exploding cap mounted upon and carried by the timer casing, and time controlled means within the casing for setting off the cap at a predetermined time.

11. A well shooting device comprising an explosive receiving shell, a timer casing adapted to telescope within the said shell as a unit, an electrical timer unit carried by the timer casing, and an initial exploder controlled by the timer unit and also carried by the casing.

12. A well shooting device including an iron shell having a water tight closure, an explosive receiving shell telescoping within the iron shell, a timer casing telescoping within the explosive receiving shell, and time controlled exploding means carried by the timer casing.

In testimony whereof we affix our signatures.

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