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WELL SHOOTING DEVICE

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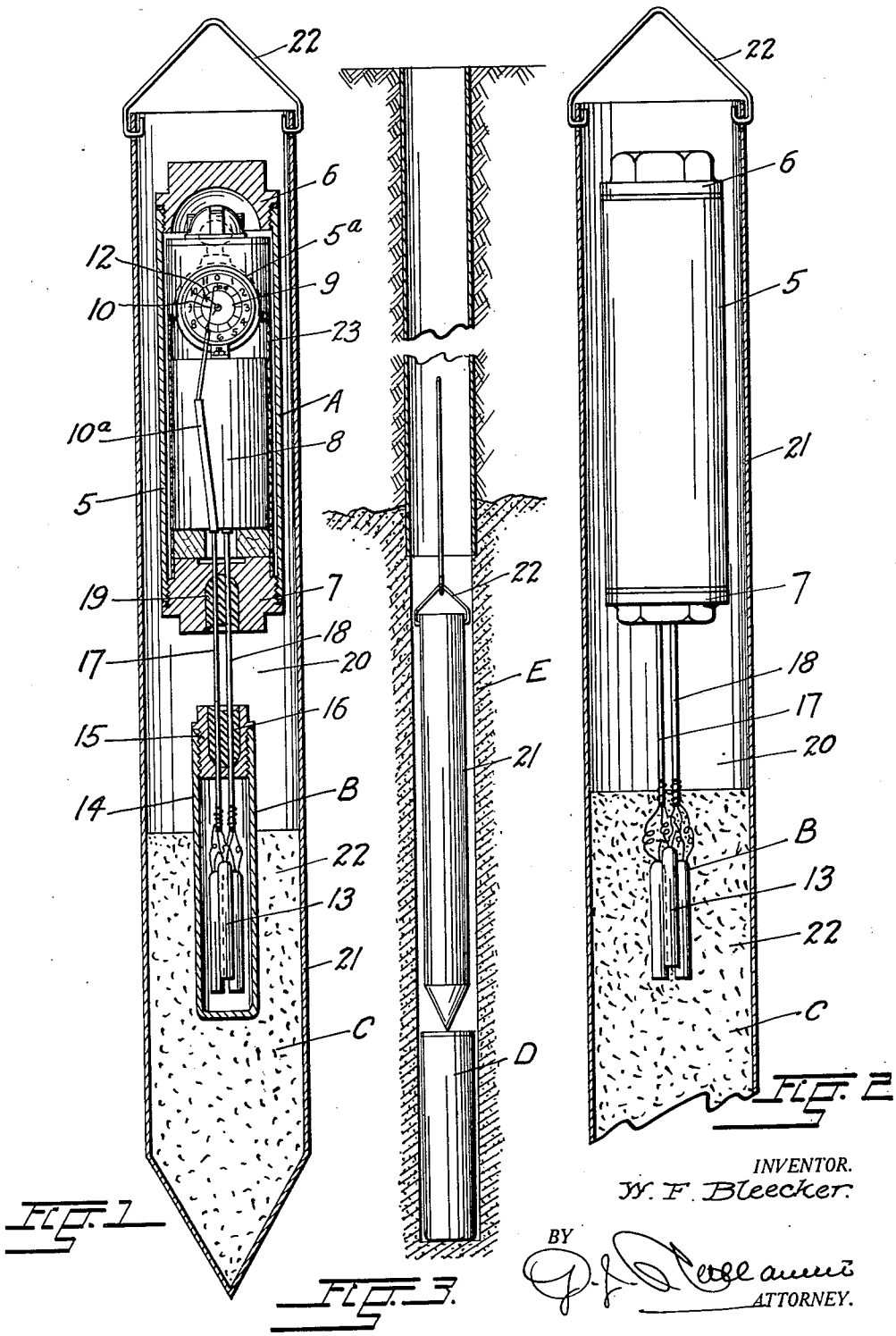


Fig. 1

Fig. 3.

Fig. 2

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WELL SHOOTING DEVICE

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This invention relates to devices for shooting oil wells at a time predetermined by the operator, commonly known as "time-bombs." The essentials of a device of this character are a time-controlling element, a detonator operated at a predetermined time by operation of the time-controlling element, an initial exploder ignited by the detonator, and a main explosive charge ignited by the initial exploder.

The main charge when exploded shatters the wall of the well in which it is placed, thereby increasing its production or effecting a flow of oil or water.

The time-controlling unit is preferably composed of a clock or watch adapted to be pre-set, in association with a circuit closer in an electric circuit in which the detonator is connected. The source of electricity is a dry-cell and the detonator may consist of a fulminate cap of any desired form or construction.

In order to protect the time-controlling unit from moisture when the bomb of which it is a part, is lowered into a well, it is enclosed in a water-tight casing and it has been customary, heretofore, to enclose in the casing with the time-controlling element, the detonator and the initial exploder, the latter usually consisting of a charge of dynamite or the like.

In the operation of a bomb of the above described type, the main charge, usually composed of nitroglycerine or other high explosive is lowered into the well. The time-unit of the well-shooting device is preset to close the circuit of the detonator at a predetermined time. The shell or casing in which the time-unit, the detonator and the initial exploder are enclosed is then lowered into the well upon the main charge and at the determined time, the time-unit closes the circuit, the detonator ignites the initial exploder and the latter shatters the casing of the device and ignites the main charge.

It has also been customary to lower the time-controlled well shooting device and the main charge simultaneously into the well by connecting the latter with the device exteriorly, as for example, through the medium of a bucket or other container.

In the method of well-shooting as hereinabove described, it has been found to be, under certain conditions, objectionable to enclose the detonator and the initial charge in the water-tight shell together with the time-unit. The objection resides mainly in the ever present danger of premature explosion, it being understood that after the time-unit has been set in operation and enclosed in the same shell with the detonator and the charge of explosive, a powerful bomb is produced, which in the event that by accident or carelessness, the circuit were closed at any time other than that controlled by the time-unit, or the charge were otherwise ignited, would become a serious menace to the lives of those in charge of the operation.

It is the main object of the present invention to eliminate all of the objectionable features of the well-shooting device as heretofore constructed, by associating both the detonator and the initial exploder or at least the initial exploder per se, with the time-unit in such a manner that the operative connection between these elements is not effected until immediately before the device is lowered into the well. Thus the bomb even after the time-unit has been set, may be handled and kept with utmost safety since the bomb becomes effective only after all of its elements as hereinbefore described have been connected in cooperative association with each other. Other objects and advantages will be brought out in the following description.

An embodiment of the invention has been illustrated in the accompanying drawings.

Figure 1 represents a sectional elevation of the improved well-shooting device,

Figure 2, an enlarged fragmentary sectional elevation showing a modified construction, and

Figure 3, a vertical section through a well, showing the time-controlled device in operative relation to the main charge of explosive in the well.

Like characters of reference designate corresponding parts throughout the views.

The well-shooting device, made in accordance with the present invention, comprises a time-controlling unit A, a detonator unit B and an initial explosive unit C, in cooperative association with each other.

The time-controlling unit consists of water-tight casing 5, imperviously closed at opposite ends, by screw-caps 6 and 7.

Inside the casing is a dry cell 8 upon which is supported a time-mechanism 9 preferably in the form of a common watch of ordinary size. The metallic parts of the watch are electrically connected with one of the poles of the cell and a contact 10 is disposed in the path of a hand 12 on the time-piece to be engaged thereby at a predetermined time.

The contact 10 together with fulminate cap or caps of the detonator unit, hereinafter to be described, is connected in a metallic circuit with the cell so that when the hand of the watch engages the contact, the current is compelled to pass through the caps which thereby are ignited.

The time-piece, the cell and the parts of the metallic circuit may be enclosed in a paper shell 23 that fits snugly inside the metal casing 5, and the shell is fitted into and carried by the screw-cap 7 so that all of the contents of the casing may be removed as an entirety, by detaching the cap 7 from the casing.

The detonator unit as shown in the drawings, comprises primarily one or more fulminate caps 13. In Figure 1, these caps have been shown enclosed in a waterproof casing 14 closed by a screw-cap 15. The casing is in the form of a capsule and its cap has a core 16 of lead or other ductile material, to secure the conductors 17 and 18 of the circuit in which the caps are connected in water-tight connection.

The method of securing the conductors by means of the ductile core avoids the use of packing glands in order to provide a water-tight joint. The conductors are preferably provided in the form of wires encased in rubber or other insulating material and they are flexible so as to form a non-rigid connection between the time-unit and the detonator-unit.

The lead in a molten condition is poured into the cavity of the screw-cap around nails or other devices of the size of the conductors, which previously have been inserted in openings in the bottom of the cavity through which, in practice, the conductors extend into the interior of the capsule. After the lead has cooled, the nails are withdrawn and the wires are inserted in the place thereof and when the wires are in place the lead is pressed tightly into the cavity of the cap and around the wires, by any suitable means, whereby to produce a water-tight joint.

The screw-plug 7 at the lower end of the casing of the time-controlling unit, has a similar ductile core 19 to secure the conductors by a water-tight joint. In case more than one fulminate cap is used, the several caps are connected in parallel in the circuit, to be simultaneously ignited when the circuit is closed, and the connections between the conductors and the caps may be made in any suitable manner.

It is preferred to make the connections by winding the two wires projecting from each cap, around the bared ends of the rubber covered flexible conductors 17 and 18, after the conductors have been secured in the screw-plug 15 and before the plug is screwed into the end of the casing 15. It is to be understood, however, that I do not limit myself to this method of effecting the operative connection of the time-unit with the detonator unit and that any other device for making the connection after the time-mechanism has been set and the casing 5 has been closed, may be resorted to within the spirit of the invention.

The initial exploder unit consists of a container 21 adapted to carry the explosive charge that has been indicated in the drawings at 22. The charge, as stated before, is usually composed of dynamite and may be provided in any desired quantity. The container may be of any suitable size, form and construction, a convenient form having been shown in the drawings.

The container, as shown, consists of a tubular bucket having a pointed bottom and provided at its top with a bail 22 for its attachment to the cable by which a device of this character is usually lowered into the well. The charge is disposed in the bottom portion of the bucket, the detonator unit is partially embedded in the charge, and the bucket may be made of sufficient depth to also contain the time-unit.

The bucket, which may be made of tin or any other suitable material, is open at its upper end, although it may be closed if so desired, it being unnecessary to protect the dynamite charge from moisture, particularly when the detonator fulminate is enclosed in a water-tight capsule, as shown in the drawings and hereinbefore described.

In the form of the invention shown in Figure 2, the fulminate caps are without casing, but for their protection are entirely and deeply embedded in the mass of the initial exploder.

In shooting a well by the use of a device made in accordance with this invention, the main explosive charge D, usually composed of nitroglycerine in a suitable container, is lowered to the bottom of the well E, as illustrated in Figure 3 of the drawings.

The watch of the time-unit is wound and set so as to cause its hand to engage with the relatively stationary contact at some predetermined future time, and after the time-unit has thus been prepared for operation, its shell or casing is hermetically closed by the

caps at opposite ends thereof so that no liquid can enter the same when it is lowered into a well containing oil or water, or both, as frequently occurs.

Before the bomb is lowered into the well, the detonator unit is attached in the circuit of the time-unit, as hereinbefore explained, and totally or partially embedded in the charge contained in the bottom of the bucket of the initial exploder unit, and the entire combination of cooperative elements is lowered into the well until it rests upon the main sand-shattering charge, as shown in Figure 3, or is otherwise placed in operative vicinity thereto.

When at the predetermined time the hand on the watch touches the stationary electric contact, the circuit is closed, the detonators are ignited, and in turn ignite the initial exploder with the result that the main charge is likewise ignited and the adjacent walls of the well are shattered to promote or induce the flow of oil, gas, water or other fluid from the exposed and opened fissures.

It will be apparent that by the use of the invention, danger to lives or properties by premature explosion, are avoided to such an extent as to be negligible, that the device which in the hands of inexperienced persons might prove to be dangerous, is rendered practically "fool-proof" and that, in comparison with bombs of ordinary construction as hereinbefore explained, the device is moreover of less complicated construction, easier assembled and operated and in consequence more readily understood by those not thoroughly experienced in handling appliances of this character.

Another advantage of the present invention is that after the time-unit has been closed, it can be tested as to its operativeness by means of a test lamp connected to the conductors 17 and 18. In fact, the lamp may be connected in the circuit immediately after the time-unit is closed and there remain until the bomb is ready to be lowered into the well.

What I claim and desire to secure by Letters Patent is:

1. In a well shooting device, in combination, a water-tight casing, time-controlling means in the casing adapted to be pre-set, a detonator outside of said casing adapted to be exploded by the time-controlling means at a predetermined time, an initial explosive charge associated with the detonator and being outside of the casing containing the time-controlled means, and a main sand shattering exploder also external to said water-tight casing and disposed to be ignited by the explosion of the initial charge.

2. In a well shooting device, in combination, an open container, a water-tight casing in the container, time-controlling means in the casing adapted to be pre-set, an initial explosive charge in said container but external to the water-tight casing and its time-controlling means, a detonator also external to the casing and associated with the initial charge, the detonator being adapted to be exploded by the time-controlling means at a pre-determined time, and a main sand shattering charge external of the container, disposed to be ignited by the explosion of the initial charge.

3. In a well shooting device, in combination a water-tight casing, time-controlling means in the casing adapted to be pre-set, a second water-tight casing outside of the first-mentioned casing and its contained time-controlling means, detonating means in the second casing connected to be exploded by the time-controlling means at a predetermined time, an initial explosive charge outside of both casings but associated with the second casing and adapted to be ignited by explosion of the detonator, and a main sand shattering charge disposed to be ignited by explosion of the initial charge.

4. In a well shooting device, in combination, a water-tight casing, a source of electricity in the casing, a circuit including the source, time mechanism in the casing controlling the circuit, an initial explosive charge outside of the casing containing the source of electricity and the time mechanism, detonator in said circuit but outside of the casing, adapted to be inserted in the explosive charge, and a main sand shattering charge disposed to be ignited by explosion of the initial charge.

5. In a well shooting device, in combination, a water-tight casing, time-controlling means in the casing adapted to be pre-set, a second water-tight casing outside of the first-mentioned casing and its contained time-controlling means, a circuit controlled by said time means, detonating means in the second casing detachably connected in the circuit inside of the latter casing, an initial explosive charge outside of both casings, but associated with the second casing and adapted to be ignited by explosion of the detonator, and a main sand shattering charge disposed to be ignited by explosion of the initial charge.

In testimony whereof I have affixed my signature.

WARREN F. BLEECKER.