Oct. 25, 1932. W. R. MURROW 1,884,125

OIL WELL TORPEDO

Filed June 4, 1930

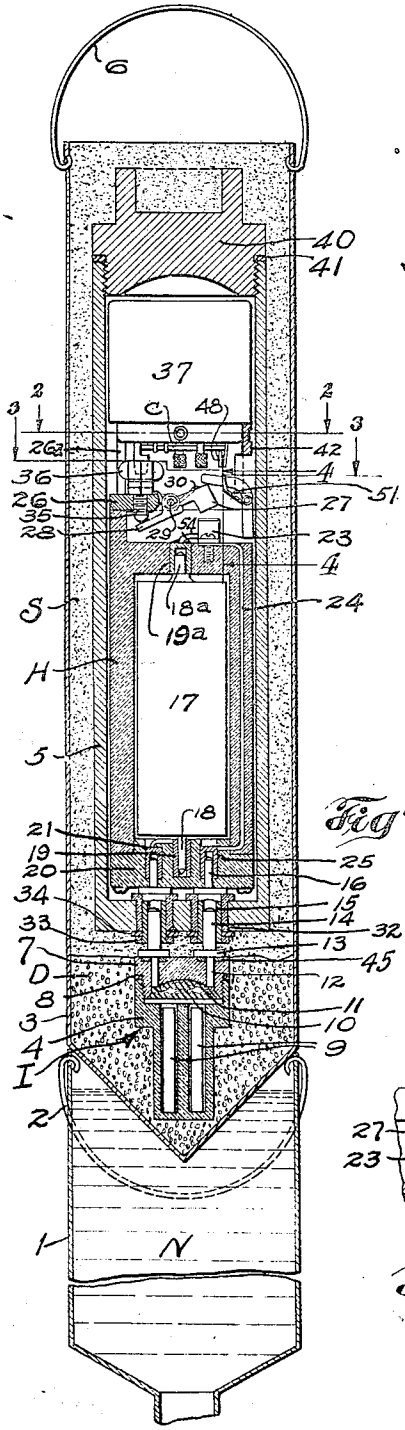
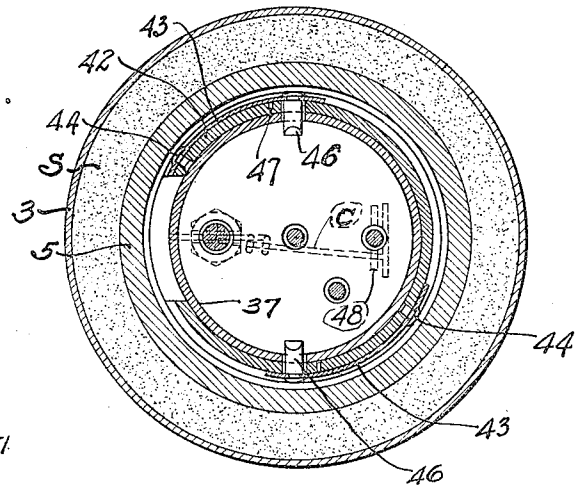


Fig. 1.

Fig. 2.



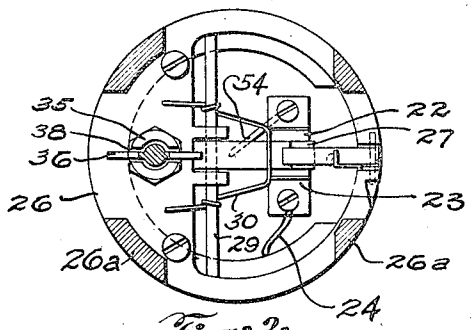


Fig. 3.

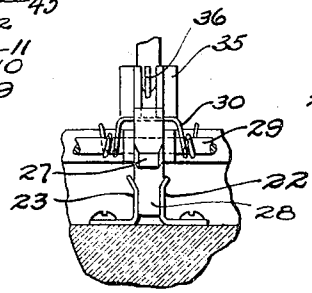


Fig. 4.

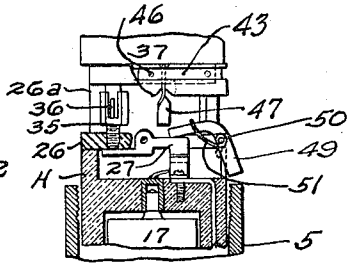


Fig. 5.

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UNITED STATES PATENT OFFICE

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OIL WELL TORPEDO

Application filed June 4, 1930. Serial No. 459,166.

My invention relates to torpedo devices used primarily for detonating explosives in oil wells and consists in a novel combination of a timing mechanism, a source of energy unit and an initial exploder which will cooperate with an explosive charge preferably lowered into the well exterior to the combination which forms my invention, but in close proximity thereto.

One of the objects of my present invention is to increase the degree of safety with which a device of this type may be used by providing additional means for preventing unintentional or premature discharge of the initial explosive.

Another object of my invention is to provide an initial exploder unit separable from the remainder of the device which may be manufactured and shipped and stored, and otherwise handled, separately from the timing and source of energy unit until the moment of final assembly of the torpedo or bomb.

Another object of my invention is to construct the initial exploder and remaining bomb structure so that they can only be assembled with their parts properly positioned to avoid unintentional firing.

Another object of my invention is to provide an initial exploder member including dynamite caps or the like, which will be a self-contained water-tight structure applicable to a timing device which comprises another self-contained water-tight structure.

These and other specific objects referred to later are attained by the structure shown in the accompanying drawing, in which—

Figure 1 is a longitudinal vertical section taken through a complete assembly of a timing device, initial exploder, a small explosive charge and main sand shattering charge.

Figure 2 is a transverse horizontal section taken on the line 2—2 of Figure 1.

Figure 3 is a similar section taken on line 3—3 of Figure 1 and omitting some of the outer elements.

Figure 4 is a detail vertical section taken on the line 4—4 of Figure 1.

Figure 5 is a detail section similar to Figure 1 but showing certain parts in a different position.

In Figure 1 the main sand shattering charge of nitro-glycerin N is contained in the tube-like member 1 which is first lowered into the well by itself by means of a bail 2 and a cable hooked onto the same. The bomb proper includes an open top container 3 of relatively light material, the lower portion of which is filled with a relatively small charge of explosive D in which an initial exploder unit I is embedded. Above the initial exploder unit is an elongated casing 5 which houses the timing mechanism and source of energy. This casing 5 is surrounded with more explosive or loose sand S and the whole device may be lowered into the well by means of the bail 6. The initial exploder unit includes a body member 4 and a cap 7 screwed into the same, a gasket 8 being provided between opposite surfaces on the body and cap whereby the interior of the body is sealed against admission of moisture from the exterior. The lower portion of the body houses a couple of dynamite caps 9 and a small quantity of flash powder 10, preferably in paste form, extending across the chamber immediately above the dynamite caps 9. A wire 11, such as tungsten, which will heat readily to the ignition point of the powder, with a substantially low electric current, extends through the powder 10 and is provided with suitable terminals 12 projecting above the top of the cap 7 and having nuts 13 threaded thereon. These nuts have upstanding studs 14 for insertion into sleeves 15 provided in the casing 5 and having upstanding pins 16. Suitable gaskets or other sealing elements 45 are provided between nuts 13 and the top of cap 7.

Sleeves 15 are surrounded with insulating bushings 32 and are fitted with suitable nuts 33 and gaskets 34 whereby the interior of housing 16 may be sealed from the exterior.

The initial exploder unit provides a water proof dynamite cap container which will permit the dynamite caps to function irrespective of high pressures which may be encountered at the bottom of a well, even though there is a column of water or oil extending

several thousand feet above the same, whereas electric or other dynamite caps, as formerly used, generally fail to fire when subjected to such pressures. Such a failure results in a great loss to the operator who is attempting to use the cap, because of the necessity of pulling and resetting a long string of pipe and cleaning out on top of the dangerous explosives in order to again prepare the well for shooting.

The lower portion of casing 5 receives a housing H of bakelite or other insulating material and containing a battery cell 17, one terminal 18 of which contacts with a centrally located conducting element 19 provided in the bottom 20 of the housing H and connected to a socket 21 spaced from the axis of the housing and battery and adapted to receive one of the pins 16. The other terminal 18^a of the battery contacts with a socket 19^a in the top of housing H connected by a wire 54 with one spring arm 22 (Figs. 3 and 4) of a switch, the other spring arm 23 being spaced therefrom and connected by a wire 24 to a second socket 25 spaced from the axis of the device similarly to socket 21.

Carried on housing H is an annular frame 26 having upstanding legs 26^a. A lever, having a head 27 and a tail 28, is pivoted on the frame at 29. A spring 30 tends to thrust the lever head 27 downwardly into contact with spring arms 22 and 23 to close the battery circuit which will extend through sockets 21 and 25, pins 16, sleeves 15, and studs 14 to terminals 12 to heat wire 11 and ignite the flash powder and thereby the dynamite caps.

The lever 27—28 is normally held in the position shown in Figure 1 by the lower end of a screw 35 adapted to be screwed upwardly by unwinding rotation of the alarm key 36 of an alarm clock 37, the key fitting into a slot 38 in the head of screw 35.

All this mechanism is enclosed in casing 5 and is sealed against the admission of liquid by the cap 40 provided with a gasket 41.

The upper portion of frame 26 includes an annular ring 42 surrounding the lower end of the clock. Flat springs 43 are riveted to ring 42 at 44 and on their free ends carry pins 46 projecting inwardly through openings in ring 42 to engage corresponding recesses in the clock case to hold the clock in the frame. Small vertically disposed levers 47 may be pressed inwardly at their lower ends to pivot on ring 42 to move the free ends of springs 43, and pins 46, outwardly to release the clock.

Preferably, the clock alarm key 36 and main winding key 48 are provided with the safety catch device C described in Patent No. 1,686,481, issued October 2, 1928 to T. M. Winder and myself, although this feature is not essential to the embodiment of my present invention. This device prevents the alarm key being unwound until after the main winding key has been rotated by the clockwork to withdraw the catch from the alarm key.

I desire to prevent the insertion of the battery housing H into casing 5 unless the contact making head 27 of the pivoted lever is elevated as shown in Figure 1. To obtain this safety precaution, I pivot a dog 49 at 50 on frame 26 and apply a spring 51 thereto tending to thrust the dog into the position shown in Figure 5 except when the horizontal leg of the dog is held up by the lever head 27, which position of the lever head only exists when screw 36 is screwed downwardly to the position it should be in before the clock 37 is assembled with the frame. At other times, the dog 49 will interfere with the insertion of the battery assembly into casing 5.

From the above, it will be seen that I have provided a timing and initial exploder unit in which the timer mechanism and the source of energy are formed separately from the initial exploder unit and each unit is housed in a separate container which is water-tight in itself and apart from the housing for the other unit.

The timing and energy unit can only be completely assembled with each other when the circuit closing lever is out of functioning position. After the different parts of this unit are assembled, as shown, there is no possibility of the contact lever being operated except by the clock in the intended manner. Furthermore, it is impossible for the dynamite cap to be assembled directly with the battery, and thereby accidentally exploded, because the initial exploder unit studs 14 will not fit into the battery housing sockets 21 and can only be connected therewith through the casing sleeves 15. As indicated, this connection can only be made with the circuit open.

Obviously, many of the details of my structure may be varied without departing from the spirit of my invention and I contemplate the exclusive use of such modifications as come within the scope of my claims.

I claim:

1. In a device of the class described, an elongated container, a quantity of high explosive in the lower portion thereof, a dynamite cap positioned in said explosive, flash powder associated with said cap, an electric current firing element for said powder, a water-tight enclosure for said cap, flash powder and element, terminals for said element projecting from the top of said enclosure, a water-tight casing above said enclosure, an electric battery, a circuit to be energized thereby and including a switch, a clock, means controlled by said clock for closing said switch, said battery, circuit, switch, clock and means being contained in said casing, a device preventing in-

sertion of said clock and said means into said casing except with said switch opened, and terminals for said circuit projecting from the bottom of said casing and arranged to connect with said first mentioned terminals.

2. In combination in an oil well torpedo device, a clock with an alarm mechanism, a screw having its head connected with said mechanism to be rotated thereby, a spring pressed lever held in raised position by said screw, a dog adapted to project from said mechanism or to be held in retracted position by said lever when said lever is in said raised position, an electric battery and wiring therefrom including a switch arranged to be closed by said lever when the latter is released by said screw; a casing adapted to receive said battery, clock, lever, and dog when said dog is retracted, terminals for said wiring on the exterior of said casing, and an initial exploder comprising a dynamite cap and flash powder and an electric current operated firing element therefor with terminals adapted to be connected to said terminals on said casing.

3. In an explosive device, a cup-like body member, a dynamite cap, a flash powder adjacent thereto, a current conducting element extending through said powder and arranged to fire said powder by means of an electric current, a top piece secured to said body member, there being a gasket between said top piece and member, terminals on said element extending through and projecting above said top piece, and gaskets surrounding said terminals, said top piece and gaskets being arranged to prevent access to said dynamite cap and flash powder by fluid under substantial pressure.

4. In a structure of the class described, a casing arranged to be operatively assembled with an explosive device, a unit comprising a source of energy and a control mechanism including a member having two positions, in one of which positions said source may function and in the other of which positions said source is prevented from functioning, said casing having an open end through which said unit may be passed into the casing, and an element on said unit normally positioned to engage the side of said casing to prevent passage of said unit into said casing, said element and member being so correlated that said member will hold said element out of its normal position only when said member is in position to prevent functioning of said source, whereby said unit may only be inserted in said casing when said source of energy is in non-functioning condition to avoid accidental ignition of said explosive device by said source of energy during the process of assembling therewith.

5. In a device of the class described, an elongated casing, an elongated housing and frame-work thereon both adapted to slide into said casing, a battery in said housing, a circuit leading from said battery to terminals on the lower end of said housing, a switch for said circuit on said frame-work and including a movable arm, a pivoted dog mounted on said frame-work and having a portion normally arranged to extend outwardly therefrom to engage the end of said casing to prevent movement of said housing into said casing, said arm being arranged, when in switch-opening position, to hold said dog with said portion retracted to avoid interference with said casing.

6. In a device of the class described, an initial exploder unit adapted to be operated by an electric current, there being electric terminals on the exterior of the body of the unit, a casing having electric terminals on its exterior adapted to engage said unit terminals and having terminals on its interior differing from said unit terminals, a housing having terminals on its exterior adapted to engage said casing interior terminal but not said unit terminals, a source of electric energy contained in said housing and connected to said housing terminals, said connection including a switch, and clock mechanism for controlling said switch.

7. In a device of the class described, an initial exploder unit adapted to be operated by an electric current, there being electric terminal posts projecting from the body of the unit, a casing having outwardly opening sockets adapted to fit said posts and having inwardly projecting terminal posts of less diameter than said unit posts, a housing having outwardly facing sockets adapted to fit said casing posts and of smaller interior diameter than said casing sockets, a source of electric energy in said housing, a circuit connecting the same with said housing sockets and including a switch, and clock mechanism for controlling said switch and means preventing the insertion of said source of energy, switch and clock into said casing except when said switch is opened.

8. In a device of the class described, a unit comprising a timing mechanism, a member comprising a source of energy, a closed container for said mechanism and member, and means associated with said mechanism and source of energy for preventing their insertion in said container except when in a predetermined relation to each other which temporarily prevents the functioning of said source of energy, said container having a single device for delivering energy therefrom, another unit including a closed container and an initial exploder therein, said second mentioned container having a single device for receiving energy from said first unit, said containers being separate from each other, and said devices being capable of operable connection with each other.

9. In a device of the class described, an initial explosive charge, and a unit for assem-

bly therewith prior to use of the device, said unit comprising a housing containing the following, a source of energy member, means for connecting said member and said charge, a control movable to positions rendering said means inoperative or operative, respectively, a timing mechanism for moving said control to said last mentioned position, and an element on said member normally positioned to prevent insertion of said member in said housing but movable by said control to a position permitting insertion of said member in said housing when said control renders said means inoperative.

10. In a device of the class described, an initial explosive charge, and a unit for assembly therewith prior to use of the device, said unit comprising a housing containing the following, an electric battery, circuit wiring for connecting said battery and said charge, a switch part for opening and closing said circuit, a timing mechanism for moving said switch part to circuit closing position, and an element on said battery normally positioned to prevent insertion of said battery in said housing but movable by said switch part to a position permitting insertion of said battery in said housing when said part opens said circuit.

In testimony whereof I hereunto affix my signature this 31st day of May, 1930.

WILLIAM R. MURROW.