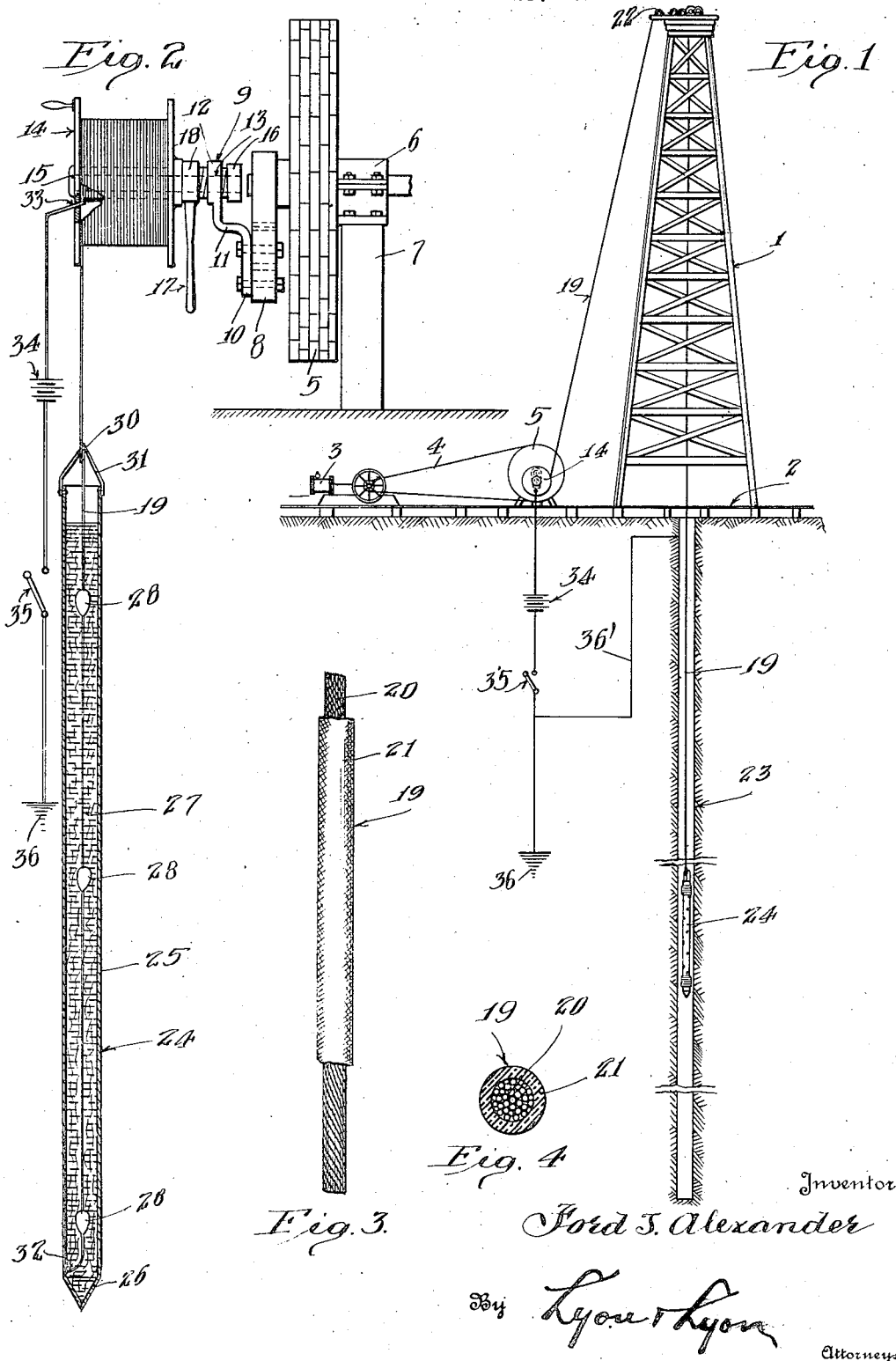


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DEVICE FOR TORPEDOING WELLS

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UNITED STATES PATENT OFFICE.

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DEVICE FOR TORPEDOING WELLS.

Application filed June 28, 1923. Serial No. 648,284.

To all whom it may concern:

Be it known that I, FORD I. ALEXANDER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Device for Torpedoing Wells, of which the following is a specification.

This invention relates to a method and means for torpedoing wells and refers particularly to the art of torpedoing oil wells by use of electrical detonating caps.

In the torpedoing of oil wells the torpedo is commonly lowered down the well on the customary "sand line" of the well equipment until the torpedo is positioned in place. When the torpedo is to be electrically detonated, an insulated wire is connected to caps in the torpedo and lowered with the torpedo as the same is lowered on the sand line, the electrical line being tied or fastened to the sand line during the lowering process to prevent entangling of the line. This method of torpedoing oil wells is unsatisfactory for the following reasons. First the customary sand line of the wells is of such weight and stiffness that the comparatively small weight of the torpedo forms a relatively small part of the total weight being lowered. Thus, in lowering a torpedo two or three thousand feet into the well, and especially when the torpedo is passing through water or other fluid in the well, the weight of the torpedo is so small compared with the line supporting the same that it is impossible to tell whether the torpedo is continuing downwardly in the well. It frequently occurs that the torpedo will become stuck or lodged in the well and the continued lowering of the sand line will cause the same to become entangled in the well without the torpedo being further lowered. To offset this effect heavy weights are frequently attached to the torpedo so that the weights and torpedo comprise a material proportion of the total weight lowered and the sand line may be stretched tautly and prevented from entangling and thus the catching of the torpedo in the well hole detected by the slacking of the sand line. However, the weight of two or three thousand feet of sand line, torpedo and auxiliary weights is such that the handling of the torpedo is extremely difficult. The torpedo must at all times be mechanically low-

ered and supported and it is difficult to determine when a decrease in weight on the line occurs. Moreover, when the torpedo is lowered through a sand line, a separate electric line must be reeled out simultaneously with the lowering of the sand line and the lowering must be stopped about every two hundred feet or so to tie the electrical line to the sand line to eliminate entangling of the lines when descending the well.

A further unsatisfactory result following from the use of a sand line for lowering the torpedo in a well is due to the fact that such sand line is commonly a metallic line which is in contact with the derrick of the well. Thus, when the torpedo is lowered upon the sand line the derrick of the well is grounded to the torpedo through the non-insulated sand line. Frequently premature explosions have resulted from this cause. These explosions may be caused from static electricity stored in the derrick, which static, when connected with the torpedo, is discharged down the sand line causing a spark around the torpedo or otherwise prematurely exploding the torpedo. Moreover, frequently electric lines are connected to lights on the derrick and the electric connections may be faulty, resulting in the current from the lines being sent down to the torpedo, causing premature explosions.

An object of this invention is to provide a method and means for torpedoing oil wells whereby the torpedo may be lowered in the well on a single insulated line of relatively light weight which line serves both to support the torpedo and to electrically connect the caps of the torpedo so that the loss of time necessary for tightening two separate lines may be eliminated and to the further important end that the weight of line extending to the torpedo shall be so materially decreased that it is possible for an operator at all times to raise or lower the torpedo with his hands to detect whether the torpedo is continuing its descent into the well; the light lowering and electrical line comprising but a comparatively small part of the weight of the torpedo and eliminating the necessity of supplying additional auxiliary weights to the torpedo to stretch and maintain the supporting line taut. Moreover, the use of such insulated lowering line eliminates the ground between the derrick and

orpedo heretofore provided by the sand line and thus avoids premature explosions from that cause.

Another object of this invention is to simplify the equipment necessary for torpedoing a well and to supply a lowering line for the torpedo, which may be readily transported to the well to be torpedoed and used in wells where the sand line has not yet been installed.

Another object of this invention is to provide a simple apparatus and attachment to the normal equipment of a well so that the normal equipment of the well may be employed in raising the line after the torpedo has been exploded.

Other objects and advantages of this invention will be apparent from the description hereinafter contained and will present themselves in the practice of the invention.

The accompanying drawings illustrate diagrammatically a preferred apparatus or equipment for torpedoing a well, in which—

Figure 1 is an elevation of the torpedoing equipment showing the torpedo descending into the well hole with the well hole in vertical section.

Fig. 2 is an elevation of the reel operating means showing the electrical connection with a torpedo.

Fig. 3 is a side view of the line employed with this invention.

Fig. 4 is a section of the supporting and electrical line.

In the drawings 1 indicates the customary derrick or tower of a well equipment, the platform for the derrick upon which is supported a suitable engine 3, having a drive connection 4 with a band wheel 5. The band wheel 5 is supported in a bearing 6 on an upright post 7 and provides the customary crank 8 which, in the normal well equipment, is employed for actuating a walking beam (not shown). The details of construction of such parts of the customary oil well equipment as are herein diagrammatically illustrated are well understood in the art and need not further be described. Moreover, the use of such standard well equipment to aid in the torpedoing method is incidental only to the preferred embodiment of the invention.

In order to employ such standard equipment for controlling the lowering line of the torpedo I provide an arm 9, one end 10 of which is bolted to the crank 8, the medial portion 11 being bent downwardly from the crank and the other end 12 extending parallel to the crank 8 and providing an opening 13 which is preferably screw-threaded. 14 indicates a reel which is rotatable on a shaft 15 which is threaded into the arm 9 through the opening 13 and held thereon by a nut 16. 17 indicates a control for the reel, one end 18 being screw-threaded to the shaft 15 be-

tween the reel 14 and arm 9. Said control 17 is positioned to tighten the reel 14 on the shaft 15, thus providing a clutch for controlling the reel 14.

19 generally indicates the combined supporting and electrical line for the apparatus which preferably is of the lightest weight construction practical for supporting the weight of a torpedo. Said line 19 preferably comprises a number of "steel" strands 20 enclosed in suitable insulating material 21. The term "steel" as employed in this specification refers not to the limited meaning of the term as applied to a specific compound of iron and carbon, but is used in the broader sense to indicate a metal of great tensile strength which may be of various compositions. Said line 19 is wound around the reel 14 and extends therefrom up and over one of the sheaves 22 on the top of the derrick 1 and extends down through the center of the derrick 1 into the well hole, generally indicated at 23, where it is secured to a torpedo 24.

The torpedo 24 may be of any preferred or customary construction. In this embodiment it is shown comprising a cylindrical container 25 having a pointed end 26. The container 25 is filled with an explosive charge indicated at 27, which may be some nitroglycerin product or other explosive. 28 indicates a number of electrical detonating caps distributed through the torpedo.

The line 19 is tied around a connection 30 through which a bail 31 secured to the top of the torpedo 24 is passed, thus supporting the torpedo 24 on the line 19. From the connection 30 the line 19 is electrically connected to the caps 28, preferably connecting the caps in series, and is then grounded to the container 25 as indicated at 32. The other end of the line 19 extends through an opening 33 in the reel 14 from which it is connected to a suitable source of electrical current, such as a battery indicated at 34, connected therefrom to a switch 35 and is then grounded at 36. 36' indicates a line extending from the switch 35 to the casing of the well hole 23 which provides a preferred form of ground for the line 19.

When torpedoing a well the only equipment necessary to transport to the derrick is the reel 14, arm 9 and torpedo 24. The arm 9 is then attached to the crank 8 of the band wheel 6 and the reel 14 fastened thereon. By loosening the control or clutch 7 one end of the line 19 is taken therefrom, passed over the derrick and secured to the torpedo 24. The torpedo is then lowered, the speed of the reel 14 being controlled through the member 17. An operator by the feel on the light line 19 may readily determine if the line is being maintained taut under the load of the torpedo 24 and thus readily ascertain if the torpedo is properly descending the

well. When the torpedo has reached the desired position the other end of the line is grounded preferably to the casing of the hole 23 and a battery or other current developing means placed in the line. Frequently use can be made of power lines supplied to the well equipment. The current will explode the detonating caps 28 and thereby the explosive charge 27 of the torpedo. Water or other fluid in the bottom of the well contacts with the exterior of the well casing 25, grounding the end 32 of the line 19. After the explosion the control member or clutch 7 is tightened to the reel 14, and the line 19 withdrawn from the well by operation of the customary motor 3 driving the band wheel 5.

While the method and means for torpedoing wells herein described is well suited for the purposes of this invention, various modifications may be made in the invention without departing from the spirit thereof. This invention is of the scope set forth in the appended claims.

I claim:

1. In a device for torpedoing oil wells or the like, the combination of a reel, an insulated stranded steel line wound on the reel, the weight of said line when lowered in a well of modern depth being small as compared with that of the torpedo, one end of said line being grounded, a torpedo supported on the line, an electric detonating cap in the torpedo, the end of the line supporting the torpedo being connected to the cap, and means connected in the line for passing a current therethrough to detonate the torpedo.

2. Mechanism for torpedoing oil wells

which includes a derrick, a band wheel, an engine for driving the band wheel, a crank carried by the band wheel, an arm secured to the crank and having an opening aligned with the axis of the band wheel, a reel supported on a shaft extending into the opening and aligning with axis of the band wheel, said reel being rotatable on the shaft, a clutch for locking the reel to the shaft, and a line wound on the reel extending over the derrick.

3. A device for torpedoing oil wells or the like, which comprises a reel, a line made up of thin strands of steel covered with insulating material wound on the reel, the weight of said line when lowered in a well of modern depth being small as compared with that of the torpedo, one end of said line being ground, and a torpedo supported solely on said line and having detonating caps therein attached to the line, and means for sending a current through the line to the caps for detonating the same.

4. In a device for torpedoing oil wells or the like, the combination of a reel, a light weight insulated stranded steel line mounted on the reel, the weight of said line when lowered in a well of modern depth being small as compared with that of the torpedo, one end of said line being grounded, a torpedo supported on the line, an electric detonating cap in the torpedo, the end of the line supporting the torpedo being connected to the cap, and means connected in the line for passing a current therethrough to detonate the torpedo.

Signed at Los Angeles, California, this 22d day of June 1923.

FORD I. ALEXANDER.