Nov. 10, 1925. 1,560,815

W. A. HILL

WELL TORPEDO

Filed March 9, 1925

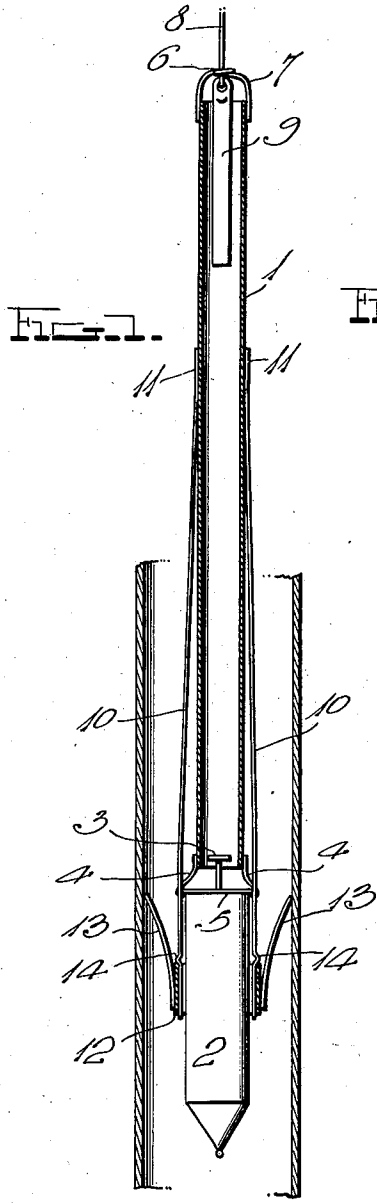


FIG. 1.

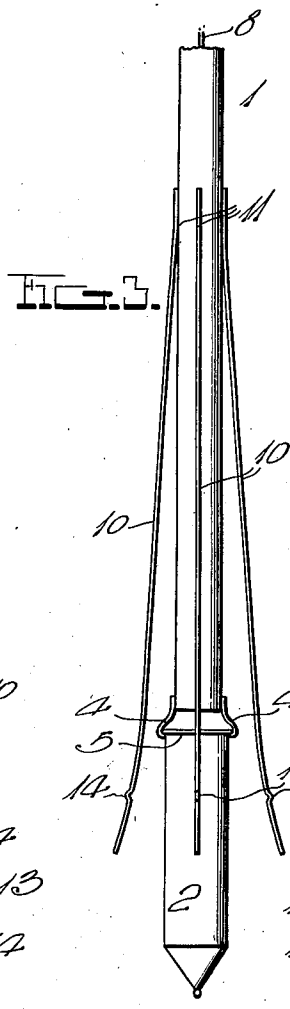


FIG. 3.

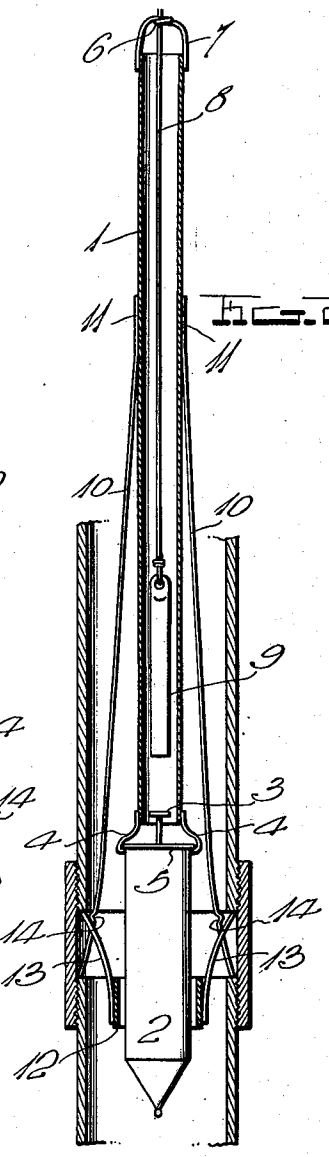


FIG. 2.

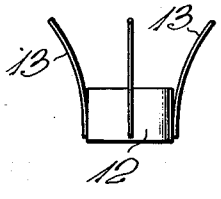


FIG. 4.

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UNITED STATES PATENT OFFICE.

WILLIS A. HILL, OF TULSA, OKLAHOMA.

WELL TORPEDO.

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To all whom it may concern:

Be it known that I, WILLIS A. HILL, a citizen of the United States, residing at Tulsa, in the county of Tulsa and State of Oklahoma, have invented certain new and useful Improvements in Well Torpedoes; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in devices which are adapted to be lowered into drilled wells and anchored therein, for one purpose or another. The present disclosure of the invention is directed to a torpedo adapted to be exploded in a well casing to break sections thereof apart.

One object is to provide an extremely simple and inexpensive, yet an efficient and reliable means for anchoring the device in a well after it has been lowered to the desired extent.

Another object is to provide a unique association of parts in which a single line acts to lower the entire device into the well, acts also to normally hold a squib firing weight above a firing pin or cap until the descent of the squib has been arrested in the well, and then further acts to permit dropping of the weight for the purpose of firing the charge.

A still further object is to provide a unique construction in which the line above referred to is instrumental in releasing the normally inert anchoring means for the device, so that such means may engage the wall of the well, usually a well casing.

With the foregoing in view, together with minor objects, the invention resides in the novel subject matter hereinafter described and claimed, the description being supplemented by the accompanying drawing.

Figure 1 is a vertical sectional view of a torpedo constructed in accordance with my invention, showing the relative positions of parts when it is being lowered into a well.

Figure 2 is a view similar to Fig. 1 but illustrating the anchoring means engaged with a joint of the well casing.

Figure 3 is a partial side elevation of the torpedo.

Figure 4 is a side elevation of a slidable collar which is instrumental in releasing supporting means for the body of the device, after such device has been lowered to the required extent.

In the form of construction selected for illustration in the present application, the numeral 1 designates a vertically elongated tube which may well be formed of tin, the lower end of said tube being provided with appropriate means for connecting it with a squib 2, the squib shown, being provided with a firing pin 3 projecting from its upper end. While this squib might be secured to the lower end of the tube 1, at the factory, it is advantageous to construct the major part of the device as a separate unit from the squib, so that a number of the devices may be shipped without the squibs at comparatively low freight rates, whereas if the squibs were shipped assembled with the other parts of a number of the devices, high freight rates would have to be paid on the entire assembly, it being remembered that all common carriers impose excessive rates for carrying explosives.

In the construction shown, a clamp is carried by the lower end of the tube 1 to engage the upper end of the squib 2, said clamp preferably comprising a plurality of spring hooks 4 which may be snapped over a rib 5 on the upper end of the squib or otherwise engaged with the latter.

The upper end of the tube 1 is provided with a line guide 6 which may well be formed by coiling the intermediate portion of a wire bail 7 whose ends are secured to said tube. Passing through the guide 6, is a wire or other line 8 whose lower end carries a squib-firing weight 9, this weight being slidable in the tube 1 and being of such a size that it cannot pass through the line-guiding eye 6.

Supporting members or anchoring members are provided for the tube 1 to support it at any desired point within a well. In the preferred form of construction, these members are in the form of vertical, spring metal arms 10 whose upper ends 11 are secured to the outer side of the tube, said arms having an inherent tendency to spring outwardly away from said tube, as shown in Fig. 3. I provide means however for holding the arms against such outward springing while the

device is being lowered into the well, but for permitting such outward springing into engagement with the well casing or perhaps the earthen wall of a well, when desired. In the preferred form of construction, a retaining collar 12 embraces the lower ends of the arms 10 as shown in Fig. 1, said collar slidably surrounding the squib 2 or any other portion of the body which is to be anchored in the well. This collar 12 is provided with tripping means instrumental in disengaging it from the arms 10, so that the latter may spring outwardly to the operative position shown in Fig. 2. In the preferred construction, spring wire arms 13 are secured at their lower ends to the collar 12 and diverge upwardly therefrom, said arms yieldably engaging the wall of the well when the device is being lowered as indicated in Fig. 1 and being in readiness to hold the collar 12 against upward movement whenever desired, for instance by engagement with a joint of a well casing, as indicated in Fig. 2. When the collar 12 is thus held against ascent, an upward pull on the line 8 by means of which the device is lowered into the well, will cause the weight 9 then contacting with the line guide 6, to pull the tube 1 and the squib 2 upwardly, the result being that the arms 10 are slid out of engagement with the collar 12 so that they may expand to the operative position disclosed in Fig. 2, thereby holding the entire device against further descent. By now releasing the line 8, the weight 9 is allowed to rapidly descend, so that it will strike the firing pin 3, or otherwise act to explode the squib 2. When the explosion is effected within the joint of a well casing, said joint is broken and the casing thus effectively parted, and if the device is used below a well casing, the earthen wall of the well will of course be blasted.

To overcome any possibility of the collar 12 sliding upwardly along the arms 10 as the device is being lowered, said arms may well be provided with stops 14 in the upward path of said collar, and these stops may be formed by bending portions of the arms. In most instances, these arms may be formed of spring wire, so that it may readily be bent to produce the stops 14 and a very cheap structure can be produced. In fact, there is no feature about the entire device requiring any appreciable amount of machine work or labor during manufacture, and hence the article will be exceptionally inexpensive. Regardless of this characteristic however, it will be seen that the invention will be highly efficient and in every way desirable. Excellent results may be obtained from the general construction disclosed and it may be followed if desired, but within the scope of the invention as claimed, numerous modifications may be made and obviously the improved supporting or anchoring means may be employed in connection with devices other than a torpedo.

I claim:

1. A device of the class described comprising a body provided with a line for lowering it into a well casing, self-projecting casing-engaging means for supporting said body in the well casing, and means for holding said supporting means against operation while lowering the device into the well casing, said holding means having a casing-engaging trip operative to release said holding means when an upward pull is exerted on the aforesaid line.

2. A device of the class described comprising a body, a self-projecting casing-engaging support for said body, a retainer releasably engaged with said support and adapted to hold it against operation while lowering the entire device into a well casing, said support being movable from said retainer when the latter is held against ascent and the body is pulled upwardly, a self-projecting casing-engaging dog connected to said retainer to hold the latter against ascent without interfering with lowering of the entire device into the well casing, and a line connected to said body for lowering the device and for upwardly pulling said body when it is desired to release said support.

3. A device of the class described comprising a body, a self-projecting casing-engaging support for said body, a collar normally engaged with said support to hold the latter against operation while lowering the entire device into a well casing, said support being slidable from engagement with said collar when the latter is held against ascent and the body is pulled upwardly, a self-projecting casing-engaging dog connected to said collar to hold the latter against ascent without interfering with lowering of the entire device into the well casing, and a line connected to said body for lowering the device and for upwardly pulling said body when it is desired to release said support.

4. A device of the class described comprising a body, a plurality of casing-engaging spring arms connected at their upper ends with said body and having an inherent tendency to spring outwardly therefrom, a collar normally surrounding the lower ends of said spring arms to hold the latter against outward springing, said spring arms being upwardly movable from said collar when the latter is held against ascent and the body is upwardly pulled, a plurality of upwardly diverging casing-engaging spring arms connected at their lower ends to said collar and adapted to hold the latter against ascent without interfering with lowering of the entire device into the well casing, and a line connected to said body for lowering the device and for upwardly pulling said

body when it is desired to release said first named spring arms from said collar.

5. A well torpedo comprising a vertically elongated squib-carrier and weight guide, a squib-firing weight slidable along said guide, a stop on the guide in the upward path of said weight, a line connected to said weight for lowering the entire device into a well, release of said line after descent of the squib-carrier has been arrested permitting descent of the weight along the guide to fire the squib, self-projecting means for arresting descent of said squib-carrier and weight guide, and means normally holding said arresting means against operation, said holding means having a trip engageable with the wall of the well and operative to release said holding means when an upward pull is exerted on said squib-carrier and weight guide by said line.

6. A well torpedo comprising a vertically elongated squib-carrier and weight guide, a squib-firing weight slidable along said guide, a stop on the guide in the upward path of said weight, a line connected to said weight for lowering the entire device into a well, release of said line after descent of the squib-carrier has been arrested permitting descent of the weight along the guide to fire the squib, said squib-carrier and weight guide being in the form of a tube in which the weight is received, said stop being embodied in the form of a line-guiding eye at the upper end of said tube, the lower end of the tube being adapted for connection with a squib.

7. A well torpedo comprising a vertically elongated squib-carrier and weight guide, a squib-firing weight slidable along said guide, a stop on the guide in the upward path of said weight, a line connected to said weight for lowering the entire device into a well, release of said line after descent of the squib-carrier has been arrested permitting descent of the weight along the guide to fire the squib, said squib-carrier and weight guide being in the form of a tube in which the weight is received, said stop being embodied in the form of a line-guiding eye at the upper end of said tube, the lower end of the tube being provided with a clamp for connecting it with the upper end of a squib.

8. A well torpedo comprising a vertically elongated squib-carrier and weight-guide, a squib-firing weight slidable along said guide, a stop on the guide in the upward path of said weight, a line connected to said weight for lowering the entire device into a well, release of said line after descent of the squib-carrier has been arrested permitting descent of the weight along the guide to fire the squib, said squib-carrier and weight guide being in the form of a tube in which the weight is received, said stop being embodied in the form of a line-guiding eye at the upper end of said tube, the lower end of the tube being provided with downwardly projecting spring hooks for engagement with the upper end of a squib to connect the latter with the tube.

9. A well torpedo comprising a vertically elongated tube having a line guide at its upper end and adapted at its lower end for connection with a squib, a squib-firing weight slidable in said tube, a line connected to said weight and passing through said line guide, the weight being of a size to prevent passage through said guide, a plurality of casing-engaging spring arms extending longitudinally of said tube and connected at their upper ends thereto, said arms having an inherent tendency to spring outwardly from the tube, a collar normally embracing the lower ends of said arms to hold them against outward springing, and a plurality of upwardly diverging casing-engaging spring arms secured at their lower ends to said collar, the first named spring arms being upwardly slidable from said collar when the tube is pulled upwardly and the collar is held against ascent by its spring arms.

In testimony whereof I have hereunto affixed my signature.

WILLIS A. HILL.