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APPARATUS FOR CUTTING OF RINSING PIPES

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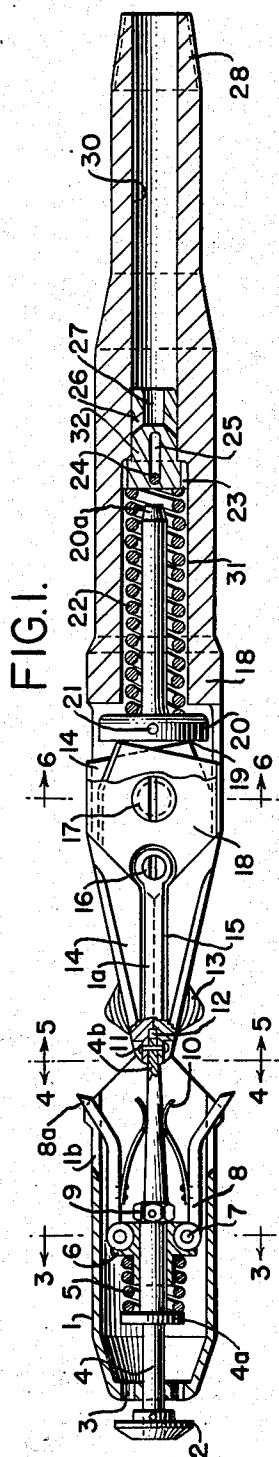


FIG. 1.

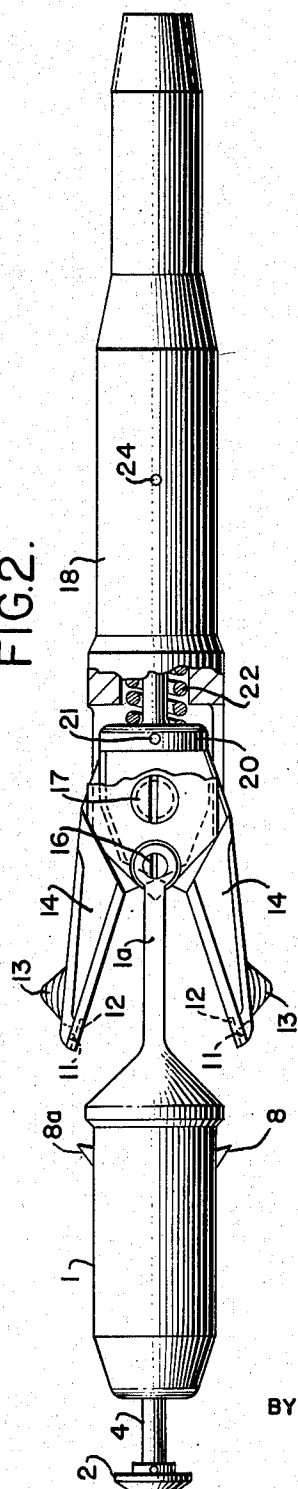


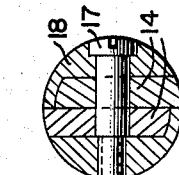
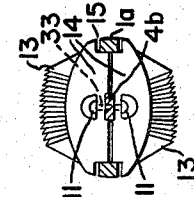
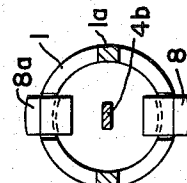
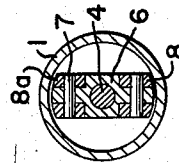
FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.



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APPARATUS FOR CUTTING OF RINSING
PIPES

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8 Claims. (Cl. 164—0.7)

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This invention relates to a cutting device for rinsing pipes of the type used in connection with the drilling of wells, particularly oil wells.

Pipes used for the aforementioned purpose become occasionally clogged, for instance due to jamming of the drill head. In such event it is very essential that the length of the pipe above the location of the obstruction is rapidly withdrawn before the sediment usually contained in the rinsing water has time to settle since accumulation of sediment will rapidly aggravate the obstruction and make it more difficult to remove the same.

There are already known pipe cutting means for the aforementioned purpose providing for unscrewing of the involved pipe sections by means of devices with left hand thread and cutting the pipe sections as they are successively withdrawn in lengths of at most fifty meters. However, these means and similar means are rather dangerous, expensive, and slow.

Accordingly, one of the principal objects of the present invention is to provide a novel and improved pipe cutting device which permits a rapid and simple removal of the obstructions in the well bore by cutting the pipes at any desired depth and just above the point of obstruction.

Another object of the invention is to provide a novel and improved pipe cutting device, the use of which makes it possible to withdraw rapidly the involved pipe sections in one piece after the pipe is cut above the obstruction.

Other and further objects, features, and advantages of the invention will be pointed out hereinafter and set forth in the appended claims forming part of the invention.

In the accompanying drawing a now preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

In the drawing:

Fig. 1 is a longitudinal section through a cutting device according to the invention.

Fig. 2 is a side view of Fig. 1 partly in section.

Fig. 3 is a section taken on line 3—3 of Fig. 1.

Fig. 4 is a section taken on line 4—4 looking in the direction of the respective arrows of Fig. 1.

Fig. 5 is a section taken on line 5—5 looking in the direction of the respective arrows of Fig. 1.

Fig. 6 is a section on line 6—6 of Fig. 1 looking in the direction of the arrows on line 6—6 of Fig. 1.

At the outset, it should be pointed out that the cutting device is in a vertical position, the left hand side of Figs. 1 and 2 being at the bottom, when the device is inserted in a pipe to be cut.

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The cutting device, as shown in the figures, comprises a hollow spindle 18 having an axial bore 30 therethrough continued in a wider bore 31. The upper end of the device (assuming the same is in vertical position) is provided with a thread 28 for the purpose of attaching the device to driving means arranged to impart a rotation to the spindle.

The lower end of the spindle supports two cutting jaws 14 pivoted to the spindle by means of a pivot pin 17 in a scissors-like manner. The portions of the jaws below pin 17 are tapered and the outside of each jaw is provided with cutting edges 13 capable of cutting a pipe when pressed against the pipe wall and the device is rotated. The cutting edges are provided for this purpose with fine teeth slanted one way. The portions of the jaws above pin 17 are in engagement with a disc 20 secured to a rod 20a. A strong coil spring 22 is fitted in spindle bore 31. This spring abuts at one end against a piston 32. This piston has an upper portion slidable in spindle bore 30 and a lower portion slidably guided in spindle bore 31 by means of spiders 23. As can best be seen on Fig. 1, a shoulder of the spindle limits displacement of the piston within the spindle. Displacement of the piston is further limited by a pin 24 secured to the inner spindle wall and engaging an axially elongated slot 25 of the piston. The upper portion of the piston includes an axial bore 27 from which extend a plurality of downwardly slanted bleeder vents 26. The purpose of this arrangement will be more fully explained hereinafter.

It will be apparent that spring 22 which should be visualized as being loaded, exerts through disc 20 a pressure against the top ends of jaws 14. As a result, the spring biases the jaws into the spread position shown in Fig. 2. In this position the top ends of the jaws are flat against disc 20 while in the closed position of the jaws the top ends thereof form an angle with disc 20, as can best be seen on Fig. 1.

Figs. 1 and 2 further show that in the closed position of the jaws the cutting edges 13 thereof are within the outline defined by the maximal cross-section of the spindle, and that in the spread position of the jaws the cutting edges thereof protrude beyond the aforementioned outline. As a result, the cutting edges cannot engage a pipe wall when in closed position but will press against the pipe wall when spread. The strength of spring 22 is so selected that the cutting edges 13 are capable of cutting the pipe wall when in the position of Fig. 2.

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When the cutting device is lowered in a pipe and no cutting is desired, the jaws 14 are held in the closed position by means of a comparatively thin wire 33, for instance a copper wire having a diameter of about two millimeters. This wire is threaded through holes 11 in the lower ends of the jaws and also through a hole in the upper end of a bar 4. Each jaw is further provided with an axially elongated groove 12, which grooves serve to receive the top end of bar 4. As can best be seen on Fig. 1, the length of the grooves is so selected that the bar 4 can perform a slight upward axial movement relative to the jaws. The lower end of bar 4 supports a plate 2 serving as a bumper. The bar further supports fixed stops 4a and 9 between which is slidable a collar 6. This collar serves to support two hooks 8 and 8a which are pivoted to the collar by means of pivot pins 7. The free ends of the hooks are bent outwardly to protrude beyond the maximal cross-section of the spindle. Leaf springs 10 abutting against bar 4 and secured to the hooks serve to spread the latter into the position shown in Fig. 1. A spring 5 abutting against stop 4a and collar 6 biases the latter against stop 9. Bar 4 is slidably guided in a casing 1, the upper portion of which is extended by two arms 1a which are pivoted to the lower end of spindle 18 by means of a pivot 16. The casing is provided with slots 1b to provide space for pivotal movements of hooks 8 and 8a. The lower end of the casing is closed and serves as guide for bar 4 which slidably protrudes from the casing. A plurality of bottom holes 3 serve to discharge rinsing water from the casing.

The operation of the cutting device, as hereinbefore described, is as follows:

Let it be assumed that it is desired to cut a rinsing pipe above an obstruction therein. Then, the cutting device is lowered into the pipe until bumper 2 strikes the obstruction. As a result, bar 4 moves upwardly, thereby breaking wire 33. The jaws will now snap into the spread position and the pipe will be cut when the spindle is rotated.

Breaking of the wire can also be effected by means of hooks 8 and 8a. For this purpose the device is lowered below the desired flange at which two pipe sections are connected by a screw joint. The hooks will permit such lowering of the device since their protruding ends can inwardly yield due to the flexibility of the leaf springs 10.

However, when the cutting device is lifted and the hook ends engage a flange the hooks will be forced outwardly. When the lifting of the device is continued, collar 6 will slide downwardly on bar 4, thereby compressing spring 5. As soon as this spring is completely compressed the outward movements of the hooks will force bar 4 upwardly, thereby causing again breaking of wire 33.

The provision of spring 5 serves to prevent an accidental breaking of the wire. When during the lowering of the cutting device the hooks hook on to a pipe joint resting on wedges, the wire may be unintentionally broken at the moment the wedges are removed. Spring 5 allows the hooks to yield within the limits set by the distance necessary for a complete compression of the springs. This distance is more than the distance the device usually is lifted when the wedges are removed.

When the wire is broken either by the bumper or the hooks, bar 4 with collar 6 falls downwardly

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in casing 1 until stopped by stop 4a. As a result, the hooks are completely withdrawn into the casing since leaf springs 10 are too weak to prevent such downward drop of the hooks.

Finally, release of the jaws can be controlled by hydraulic pressure. For this purpose fluid under pressure such as water, is directed through the spindle bore 30 against the top portion of piston 32. As a result, the piston will be forced downwardly in the spindle, thereby compressing spring 22. The increased pressure now exerted by the spring upon the jaws will cause breakage of wire 33. As will be noted, a passage through bore 27 and vents 26 will be established with the open spindle bore 31, thereby preventing an excessively high pressure being built up in spindle bore 30 when the piston is moved a certain distance.

As will appear from the previous description, the several means for causing breakage of wire 33 may be alternately used. Under certain conditions, it may be inconvenient or impractical to release the jaws either by the action of bumper 2 or by the pull-up action, both actions causing release of the jaws by breakage of shearing wire 33, for instance when there is no suitable abutment surface for the bumper or a pipe collar engageable by hooks 8 and 8a is not available.

In such case, release of the jaws can be controlled by a shearing member such as a copper wire threaded through a hole 21 in disc 20 and through a corresponding bore in spindle 18. This wire, when kept taught, will prevent spreading of the jaws by action of spring 22. For purpose of breaking the wire, hydraulic pressure is applied to piston 32 as previously described. As will be apparent, the wire 33 need not be provided when the wire through hole 21 is employed. However, in some cases it may be advantageous to employ both the wires. The operator then has the choice to employ either the bumper or the hooks or hydraulic pressure only. Of course, in any event he must break the wire through hole 21 by use of hydraulic pressure since otherwise the jaws will not spread when wire 33 is broken.

What is claimed is:

1. A cutting device for cutting pipes of the type used in connection with the drilling of wells, comprising in combination a rotatable hollow spindle adapted to be coupled on one end with driving means for imparting rotation to the spindle, a pair of jaws having cutting edges thereon suitable for cutting the wall of a pipe articulated to the other end of the spindle in a scissors-like arrangement, loaded spring means disposed within the hollow spindle and biasing said jaws into a position in which the jaw portions having cutting edges thereon are spread, wire means applied to the jaws for closing said jaw portions against the action of said spring means, said cutting edges being within the outline defined by the maximal cross-section of the spindle when the jaws are held closely together and protrude therefrom, when the jaws are spread, for cutting engagement with a pipe to be cut, and wire breaking means including an elongated member attached to said wire means axially movable relative to the spindle, axial movement of the said member effecting breaking of the wire means, and actuating means operable by engagement with an obstruction in a pipe to be cut and operatively coupled with said movable member for imparting a wire breaking axial movement

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to the same in response to an engagement of the actuating means by an obstruction in the pipe.

2. A cutting device as defined in claim 1, wherein the said member is in form of a bar axially movable in alignment with the spindle axis and having on one end a hole therethrough through which said wire means are extended, thereby suspending the bar from the jaws, the other end of said bar being engageable with an obstruction in the pipe within which the cutting device is lowered.

3. A cutting device as defined in claim 1, wherein the said actuating means comprise a pair of hooks pivotally supported on one end by said axially movable member, the free ends of said hooks facing said spindle, and wherein second spring means engage said member and said hooks for biasing the latter toward a position in which the free ends of the hooks protrude from the outline defined by the maximal cross-section of the spindle, said hooks being arranged yieldably toward the said member upon lowering of the cutting device within a pipe and capable of engaging an inwardly protruding pipe flange upon lifting of the device within the pipe, whereby the said member is lifted toward the said jaws and causes breaking of said wire means.

4. A cutting device as defined in claim 3, in combination with a casing pivoted to said spindle in axial alignment therewith and spaced therefrom to provide space for the jaws between the casing and the spindle, said axially movable member and said hooks pivotally supported thereon being disposed within the casing.

5. A cutting device as defined in claim 4, wherein the said member is in form of a bar, and wherein the said hooks are pivoted to a collar axially slidable on the bar, and wherein two stops are fastened to the bar between which stops said collar is slidable, and wherein spring means disposed between the stop distal to the jaws and the collar biases the latter against the other stop, said distal stop being engageable with the bottom end of of the casing distal to the jaws for arresting the bar when the wire means are broken.

6. A cutting device for cutting pipes of the type used in connection with the drilling of wells, comprising in combination a rotatable hollow spindle adapted to be coupled on one end with driving means for imparting rotation to the spindle, a pair of jaws having cutting edges thereon suitable for cutting the wall of a pipe articulated to the other end of the spindle in a scissors-like arrangement, loaded spring means disposed within

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the hollow spindle and biasing said jaws into a position in which the jaw portions having cutting edges thereon are spread, wire means applied to the jaws for closing said jaw portions against the action of said spring means, said cutting edges being within the outline defined by the maximal cross-section of the spindle when the jaws are held closely together and protrude therefrom, when the jaws are spread, for cutting engagement with a pipe to be cut, and wire breaking means including a member movable within the spindle and operatively connected when the wire means so as to effect breaking of the same in response to a movement of the member relative to the spindle and actuating means coaxing with the movable member for imparting a movement to the same for the purpose aforesaid, wherein said movable member of the wire breaking means comprises an abutment member axially movable within the spindle, the said abutment member abutting on one side against the jaws and being engageable on the other side with one end of the spring means, and wherein the said actuating means comprise a piston slidable within the spindle and abutting against the other end of the spring means, and wherein conduit means adapted to be connected to a supply of fluid under pressure are provided for applying pressure to said piston, the said piston pressure being added to the pressure of the spring means within the spindle for effecting the breaking of the wire means, thereby releasing the jaws for spreading.

7. A cutting device as defined in claim 6, wherein said piston includes vent openings arranged to open a passage between the pressure side of the piston and the opposite side thereof when the piston is displaced within the spindle for a distance sufficient to effect breakage of the wire means.

8. A cutting device as defined in claim 7, wherein the said abutment is in form of a disc member fitted between said spring means within the spindle and the jaws to transmit spring pressure to the latter.

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