Sept. 15, 1942. S. J. DIETZMANN ET AL 2,295,720

SUCKER ROD TOOL

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Fig. 1.

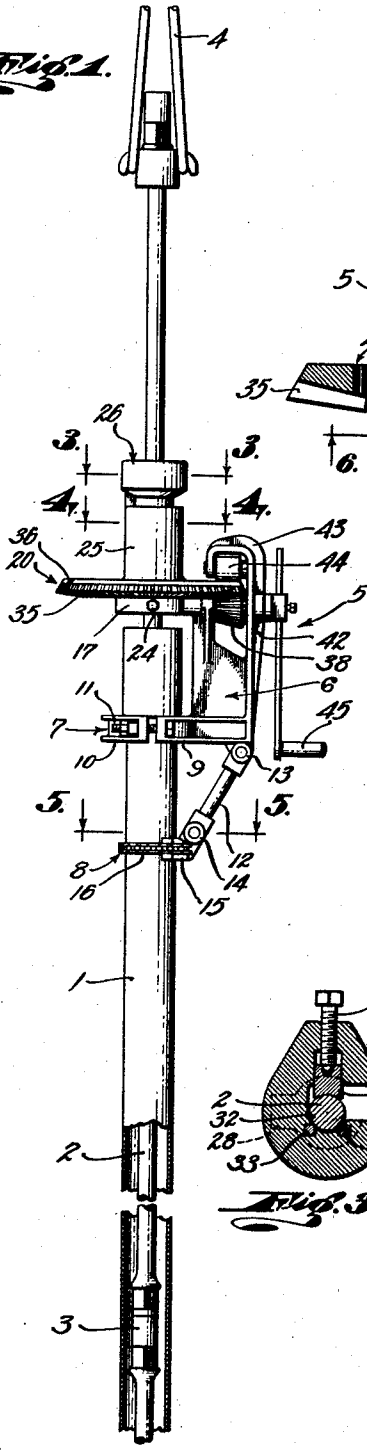


Fig. 2.

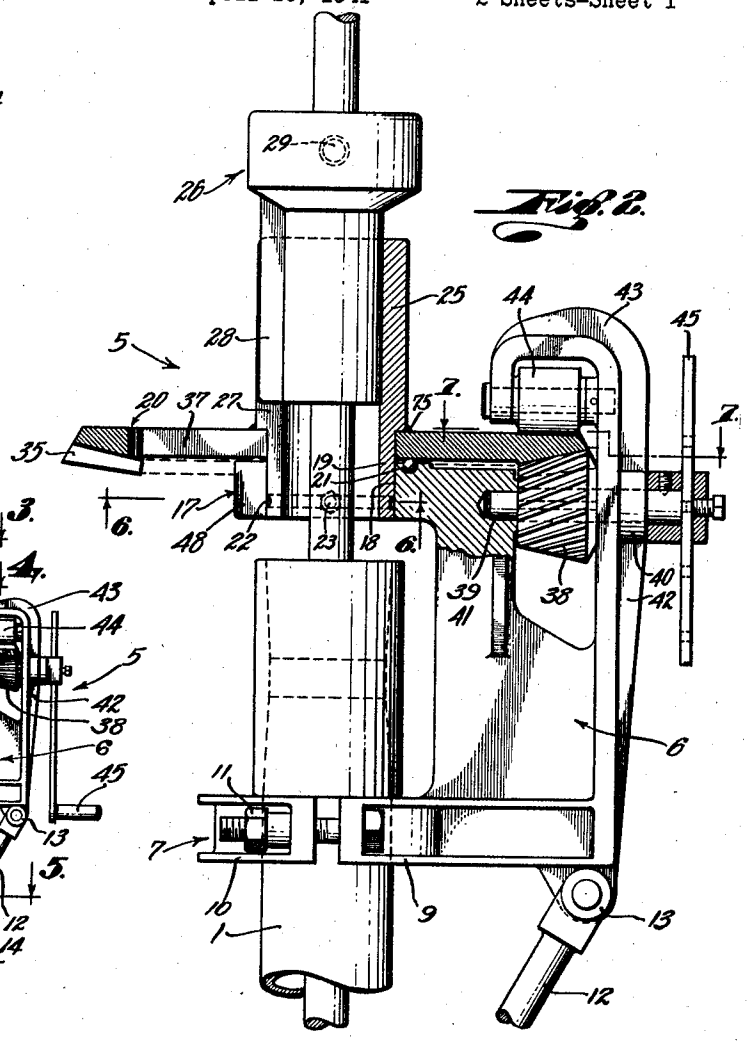


Fig. 3.

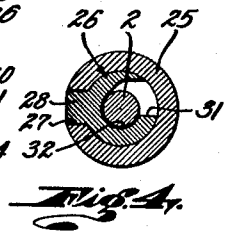
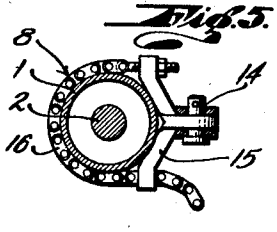


Fig. 4.

Fig. 5.



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Fig. 6.

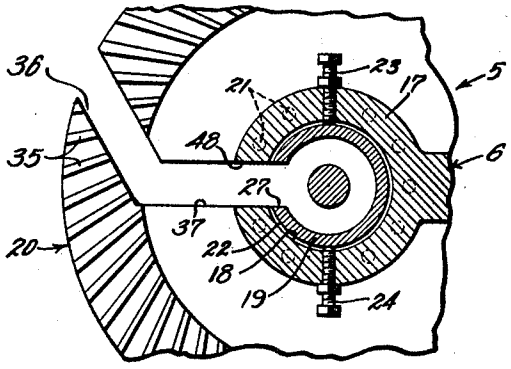


Fig. 7.

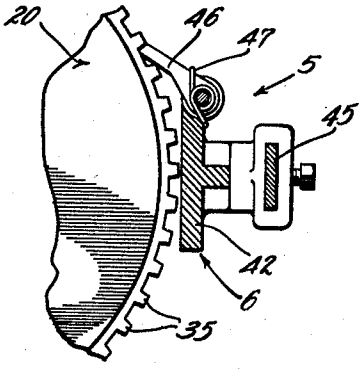


Fig. 8.

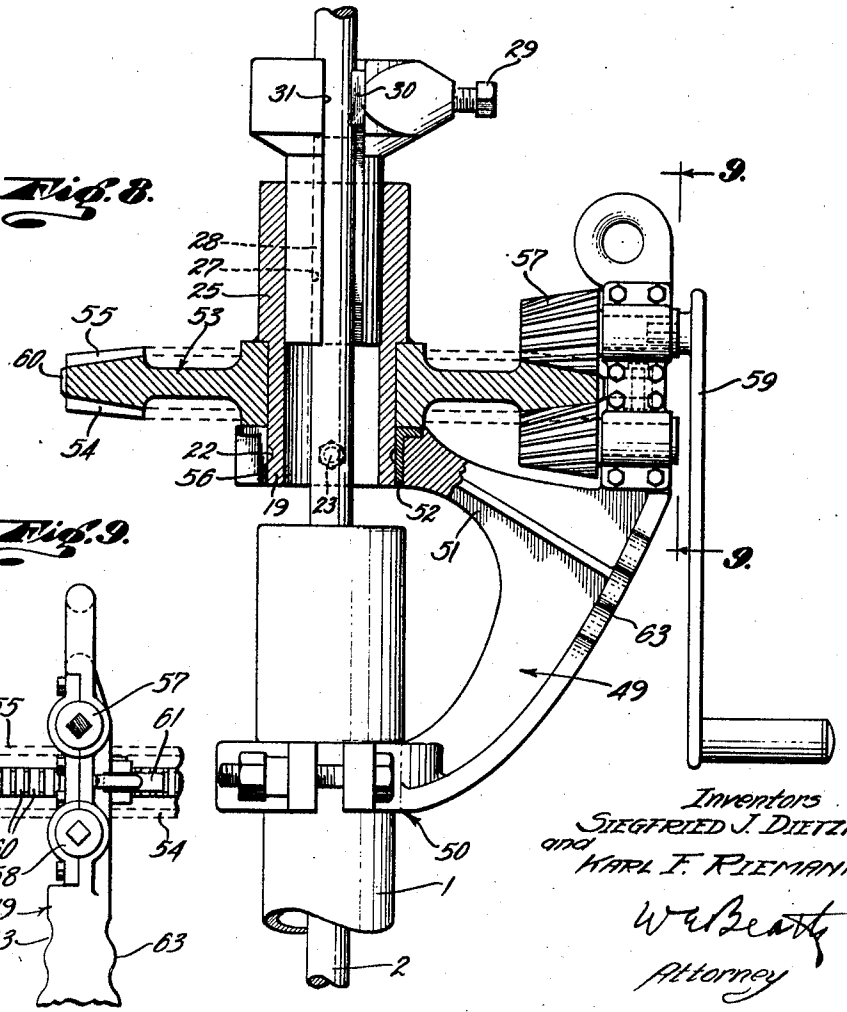


Fig. 9.

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SUCKER ROD TOOL

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Application April 16, 1941, Serial No. 388,814

8 Claims. (Cl. 255—35)

This invention relates to a sucker rod tool for uncoupling the sucker rod as used in oil wells.

When the oil well becomes sanded up, it is necessary to pull the pump string, that is it is necessary to uncouple the sucker rod and its tubing, and remove them section by section until the full length of the sucker rod and its tubing have been removed from the well, for repair purposes. Heretofore it has been customary when the well is sanded up, to fasten a wheel to the sucker rod, the wheel having four levers or bars projecting from it, and with one man pushing on each bar, the men walk around in a circle to twist the sucker rod in an attempt to make it unscrew at one of its sections. During this time, the hoist applies a lifting force to the sucker rod. If the workmen cannot apply enough torsional force to the sucker rod to make it uncouple at one of its joints, it is customary to set a post in the path of one of the levers and then the men duck and let go of the levers so that one of them will strike the post and jar it to bring about the uncoupling. This practice is very dangerous and has resulted in the loss of life and limb for two reasons. In the first place, bearing in mind that the sucker rod is several thousand feet long, four men twisting it can store up a large amount of torsion in it, and when the levers are released, if the men don't get out of the way fast enough, they are struck and seriously injured. In the second place, when the men are in the act of twisting the sucker rod, with the hoist pulling upwards on it, the sucker rod frequently comes uncoupled at an unexpected moment, whereby the tension of the hoist pulls the sucker rod and the four levers connected to it upwardly with a rapid jerk, and workmen have been seriously injured by being struck under the chin or otherwise by the upwardly moving levers.

It is an object of the present invention to overcome the above defects and to provide a sucker rod tool which may be used with safety, and without hazard to life and limb as above noted.

Another disadvantage of the prior practice is that, aside from being dangerous, it is slow and tedious and requires the services of several men to operate it. It is another object of the invention to provide a sucker rod tool which may be readily applied to the sucker rod and which may be operated by a single handle requiring the services of only one man. Although of course, more than one man could operate the handle if desired, or in fact it could be operated by any suitable source of power.

The safety features and various advantages of the present invention will be better understood by referring to the drawings wherein Fig. 1 is a view in elevation of the sucker rod tool of this invention in working position on a sucker rod and its tubing.

Fig. 2 is an enlarged view in elevation, partly in section, of the sucker rod tool of Fig. 1, with certain parts broken away.

Figs. 3, 4 and 5 and 6 are sectional views on lines 3—3, 4—4, 5—5, 6—6 respectively.

Fig. 7 is a plan view partly in section of a dog for preventing clockwise rotation of the gear.

Fig. 8 is a view in elevation, partly in section, of a modification for turning the gear at different speeds.

Fig. 9 is a sectional view on line 9—9 of Fig. 8.

Referring in detail to the drawings, the reference No. 1 represents pump tubing of an oil well, the tubing being in position in the well with a sucker rod 2 therein. As usual, the tubing 1 is made up in sections, and the sucker rod 2 is also made up in sections and provided with screw couplings 3. The top of sucker rod 2 is connected to a cable 4 connected to a hoist not shown to pull upwardly on the sucker rod 2 while it is being uncoupled. It is assumed that the oil well has been sanded up, and that the pump string 2, 3 must be removed from the well for repair purposes. This is accomplished according to the present invention by means of a sucker rod tool 5 which comprises a frame 6 which is adapted to be supported at the top of tubing 1 by means of the tubing clamps 7 and 8, although the clamp 8 may be omitted. Clamp 7 comprises a semi-circular portion 9 as on the frame 6 with a cooperating semi-circular band 10, the portions 9 and 10 being removably clamped around the tubing 1 by means of nuts and bolts such as 11. The clamp 8 comprises a brace 12 pivotally connected at 13 to the bottom of frame 6 and pivotally connected at 14 to a bracket 15 having a chain clamp 16. The frame 6 has a horizontal arm 17 having a central aperture 18 in which fits the sleeve 19 of a ring gear 20. The top of arm 17 is provided with a plurality of balls 21 which serve as a bearing support for the gear 20. The sleeve 19 has a groove 22 and a pair of cooperating lock pins 23 and 24 shown in Fig. 6, to prevent vertical movement of gear 20. The sleeve 19 extends above gear 20 a substantial distance as shown at 25 and it houses a mandrel or clamp 26 with which it has a sliding key fit. The sleeve portion 25 is provided with a lateral slot 27 in which the key 28 on mandrel 26 slides. The mandrel 26 is secured to the sucker rod 2

by means of the bolt 29 which has its inner end rotatably secured to a block 30, or bolt 29 may bear loosely on the block 30. The mandrel 26 has a lateral slot 31 to receive the sucker rod 2, this slot communicating with a central bore 32 having steel block inserts 33 and 34, a corner of each thereof projecting into the central bore 32 in order to bite into the sucker rod 2 when the bolt 29 is turned down, to prevent the mandrel 26 from slipping on the sucker rod 2.

Gear 20 as shown in Fig. 6 has spiral or helical teeth 35 and across these teeth is cut a slot 36 to receive the sucker rod 2. Slot 36 after it crosses the teeth 35 is turned radially as shown at 37 and communicates with the central bore of the sleeve 19—25, welded to gear 20 at 75.

The sleeve portion 25 and the key 28 and slot 27 are elongated as shown, in order to permit the mandrel 26 to ride up and down with the motion of the sucker rod 2 when the gear 20 is rotated. Also, the key 28 and the slot 27 permit the mandrel 26 to slide out of the sleeve 25 when the sucker rod 2 is uncoupled, this operation not enabling danger to the workmen. The gear 20 is rotated by a suitable means such as the pinion 38 rotatably mounted in bearings 39 and 40 formed in the upwardly extending arms 41 and 42 of the frame 6. Frame 6 has an overhanging bracket 43 in which is rotatably mounted a roller 44 bearing on the top of gear 20 to keep it in mesh with the pinion 38. The pinion 38 is provided with a suitable handle 45 for rotating it.

As shown in Fig. 7, the frame 6 is provided with a dog 46 which is pressed by a spring 47 to engage the edge of the teeth 35 in order to prevent the gear 20 from moving clock-wise when it is being turned counter-clockwise by the handle 45 to uncouple the sucker rod 2.

The bearing formed by the arm 17 is provided with a slot 48 as shown in Fig. 6 to receive the sucker rod.

In the use of the tool, with clamps 7 and 8 open, the tool 5 is moved into position on the tubing 1 as shown in Fig. 1, at this time the gear 20 having been rotated so that the slots 36, 37 in gear 20 and the slot 48 in the bearing 17 are in alignment so that the sucker rod 2 will pass through these slots to the bore of the gear 20. At this time the mandrel 26 is not in position on the sucker rod 2. It is then applied thereto, and the mandrel 26 is turned so that the key 28 will drop in the slot 27. The mandrel 26 is then secured to the sucker rod 2 by the bolt 29. The hoist pulls upwardly on the cable 4 to counteract the weight of the sucker rod, which is usually several thousand feet long, and the device is ready to operate by simply turning the handle 45. The dog 46 prevents the gear 20 from turning back, and when enough torsion is applied to the sucker rod 2 to uncouple it, the upper portion of the sucker rod 2 jumps up carrying with it the mandrel 26 which does not endanger the workmen operating the handle 45.

According to the modification shown in Fig. 8, the bracket 49 has no lower tubing clamp on it such as 8 and instead terminates in a tubing clamp 50. The bracket 49 has an arm 51 which provides a bearing 52 for the gear 53 which has one set of teeth 54 on its underside and another set 55 on its top. Bearing 52 is provided with a sucker rod receiving slot 56 as before, and the gear 53 is provided with a slot such as 36, 37 above described. Bracket or frame 49 carries a pinion 57 meshing with the teeth 55 and a pinion 58 meshing with the teeth 54. Pinions 57 and and 58 are of different sizes in order to rotate the gear 53 at a high or low speed. The pinions are driven one at a time by means of a suitable handle such as 59. Gear 53 is provided on its periphery with notches 60 which cooperate with a dog 61 to prevent the gear 53 from turning back when it is under torsion of the sucker rod 2. The front of bracket 49, and the same is true of frame 6, may be about as wide as a human hand in order to provide a hand hold, and the edges of the frame 49 may be undulating as shown at 63 to form a hand grip.

The invention relates broadly to the use of a sucker rod clamp which is adapted to slide up and down in and automatically uncouple from its driving element, and it will be understood that various modifications may be made in the safety device herein shown and described without departing from the spirit of the present invention.

We claim:

1. A sucker rod tool comprising the combination of a frame, means for securing said frame to the top of tubing from which a sucker rod projects, a gear rotatably carried by said frame, means for rotating said gear, said gear having a central bore communicating with a sucker rod receiving slot, a mandrel having a sliding key fit with the central bore of said gear, said mandrel having a lateral slot and a central bore to receive the sucker rod, and means for securing said mandrel to the sucker rod.

2. A sucker rod tool comprising a mandrel having a lateral slot and a bore to receive the sucker rod, means for securing said mandrel to the sucker rod, a gear having a socket to slidably and non-rotatively receive said mandrel, and means for rotating said gear, whereby said mandrel is adapted to slide out of said gear when the sucker rod is uncoupled.

3. A sucker rod tool comprising a frame, a gear rotatably carried thereby, said gear having a central bore and slot, and said frame having fastening devices permitting the sucker rod to pass through said slot to the axis of said gear and permitting said frame to be laterally applied to the tubing, a mandrel having a sliding key fit with the bore of said gear and means for securing said mandrel to the sucker rod.

4. A sucker rod tool comprising a frame having a tubing clamp, a mandrel having a sucker rod receiving bore, said mandrel having a cut for laterally assembling said mandrel around the sucker rod, a gear having a socket for said mandrel, a bearing for said gear on said frame, said gear and said bearing each having a cut to permit laterally assembling said gear and said bearing coaxially of the sucker rod, and means for rotating said gear.

5. A sucker rod tool comprising a frame, means for securing said frame to tubing from which a sucker rod projects, a gear having teeth, a bearing on said frame for said gear, said gear having a central bore to receive the sucker rod, said gear having a slot extending from the periphery of said gear across said teeth and communicating with said bore, a sucker rod receiving slot in said bearing, a mandrel fitting said bore and having a slot to laterally receive the sucker rod, means for securing said mandrel to the sucker rod, a key on said mandrel adapted to engage the inner end of the slot in said gear, and a cooperating rotatable member on said frame for driving said gear.

6. A sucker rod tool comprising a combination of a frame, means for securing said frame to the top of tubing from which a sucker rod projects, a gear having teeth on opposite sides thereof rotatably carried by said frame, a pinion for the teeth on each side of said gear, said gear having a central bore and a lateral slot to receive the sucker rod, a bearing for said gear, a sucker rod receiving slot in said bearing, a mandrel having a sliding key fit with the central bore of said gear, and means for securing said mandrel to the sucker rod.

7. A sucker rod tool comprising a frame having a tubing clamp, a mandrel having a sucker rod clamp, said mandrel having a cut to laterally receive the sucker rod, a gear, a bearing on said frame for said gear, said bearing and said gear having cuts to laterally receive the sucker rod, said gear having a bore to slidably and non-rotatively receive said mandrel, and means on said frame for rotating said gear.

8. A sucker rod tool according to claim 7 comprising a plurality of pinions operatively connected to drive said gears at different speeds, and bearings on said frame for said pinions.

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