

May 24, 1949.

D. R. CORMANY
TUBING ROTATOR

2,471,198

Filed March 22, 1948

3 Sheets-Sheet 1

Fig. 1.

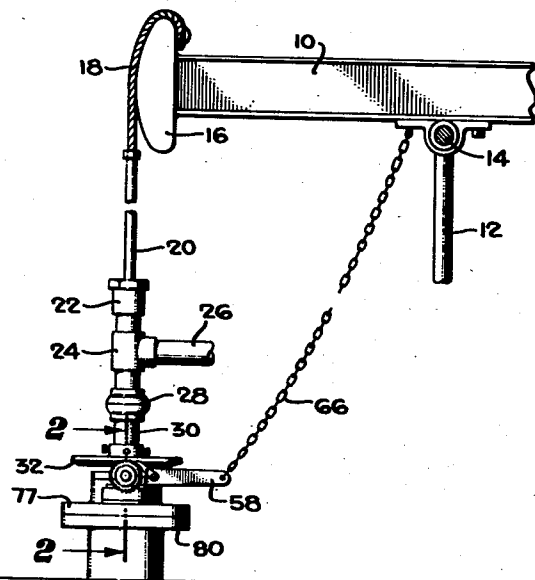
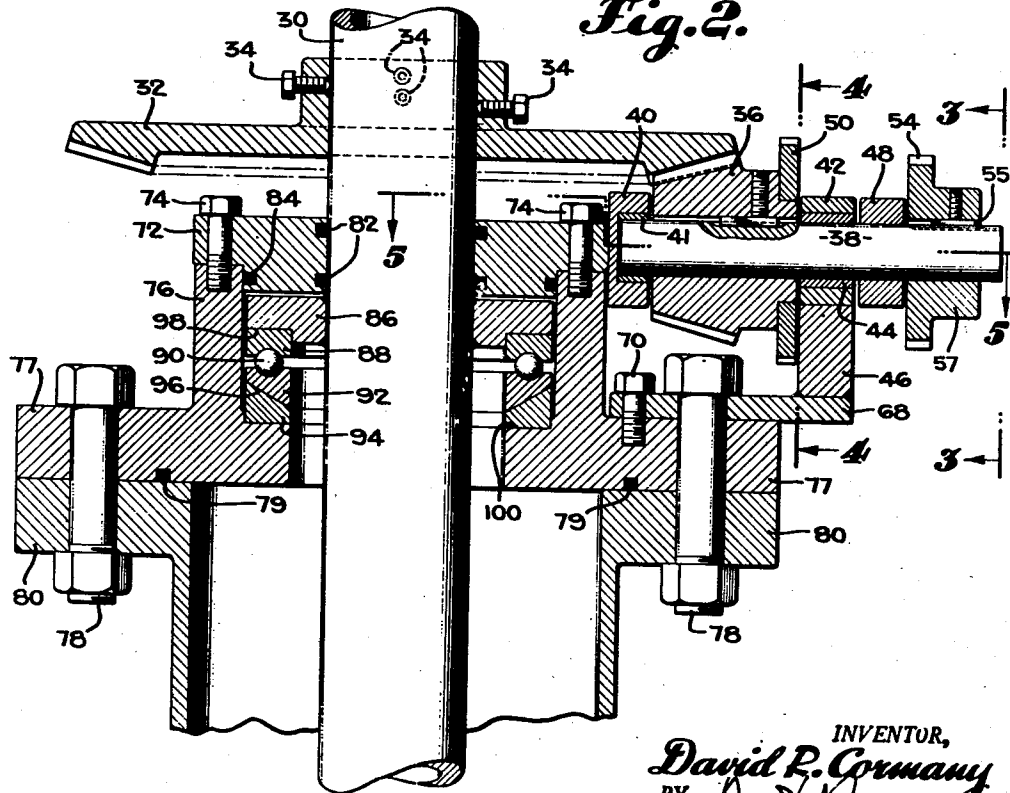


Fig. 2.



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Fig. 3.

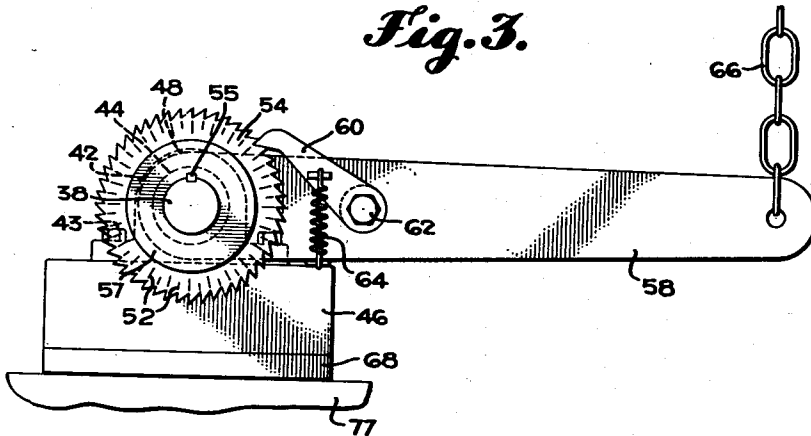


Fig. 4.

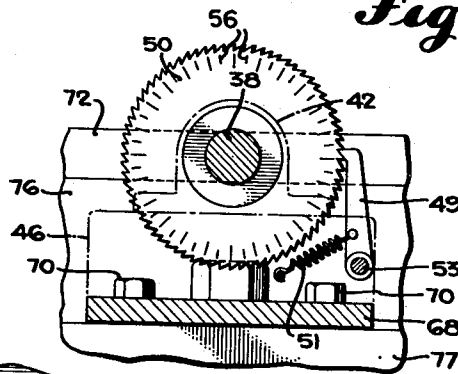
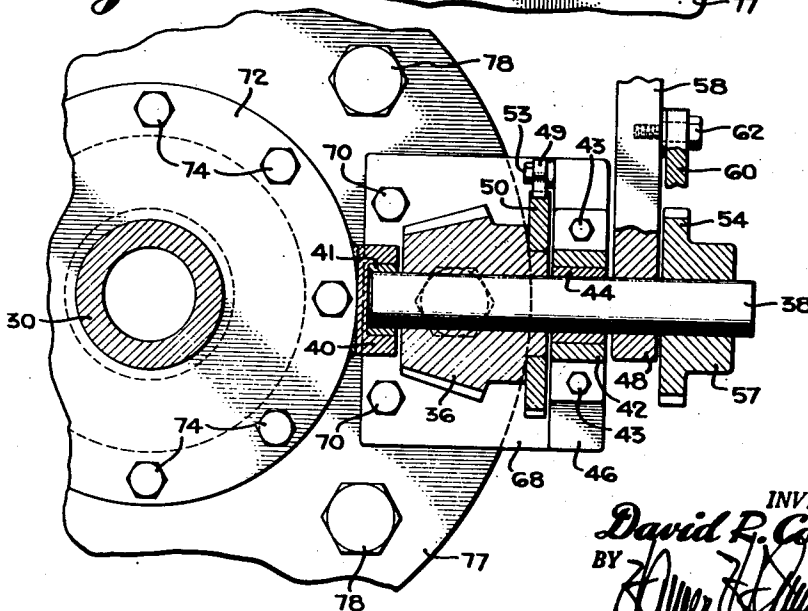


Fig. 5.



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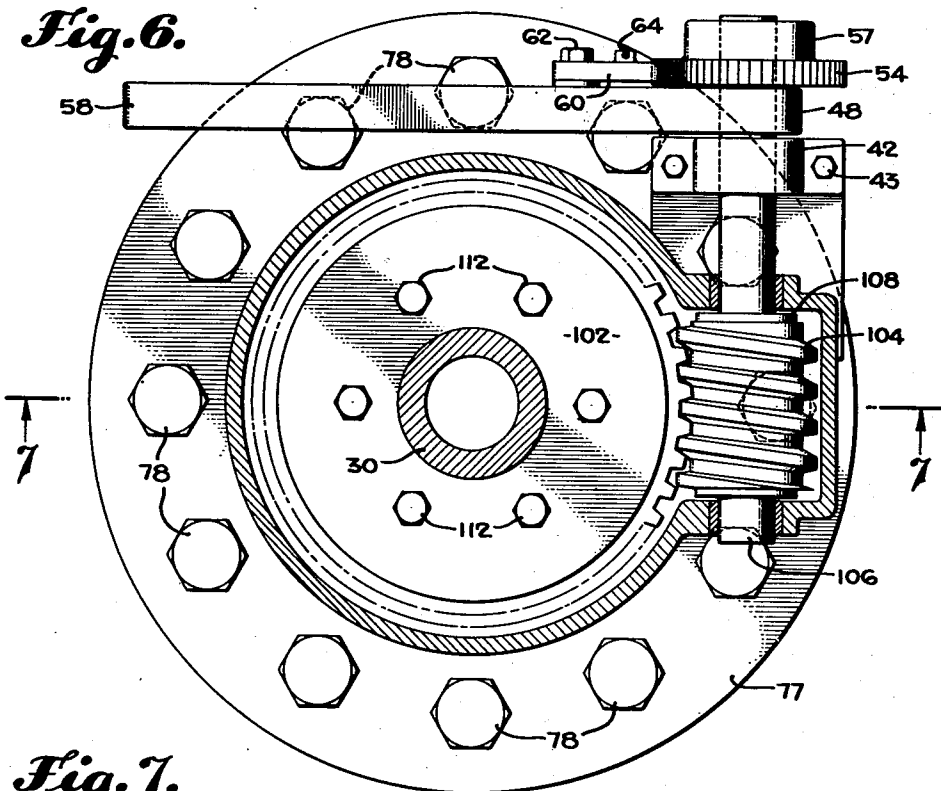
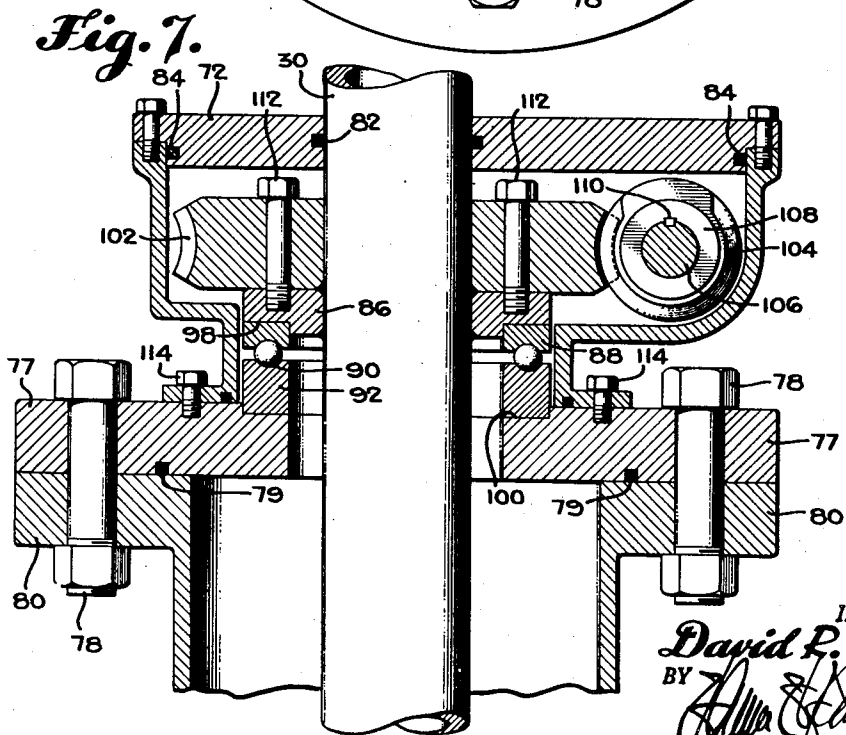
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3 Sheets-Sheet 3



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2,471,198

TUBING ROTATOR

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1 Claim. (Cl. 166-14)

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This invention relates to the oil well drilling industry and it particularly pertains to a new casing head and particularly the mechanism in connection therewith for rotating the tubing during the pumping operation.

It is an object of this invention to provide a casing head in which measured rotation of the tubing during the pumping operation will spread the wear caused by reciprocation of the sucker rods around the inside of the tubing.

It is a further object of this invention to spread the wear around the outside of the tubing by the same measured rotation of the tubing. This wear on the outside of the tubing is caused by vibration of the tubing couplings and the slight moving or breathing of the tubing against the well casing that is set up by the pumping operation in the well.

It is a further object of the invention to distribute the wear evenly on the outside diameter of the plunger and on the inside diameter of the barrel of the oil well pump that is attached to the bottom of the sucker rods. This is true in both the type of well pump in which the barrel travels and the type in which the plunger travels. Prior to this invention the pump showed uneven wear on one side or the other and with this invention the wear is evenly distributed in the oil well pump between the plunger and the barrel.

It is a further object of the invention to materially retard and reduce the galling action between the like metals of which the tubing and its contiguous parts, such as sucker rods on the inside and casing on the outside, are made. This invention also gives a polishing action to the tubing both on the inside and on the outside at the points of contact with these contiguous parts and so it helps to reduce corrosion as well as wear. It is a further object of this invention to reduce the wear between the well tubing and its contiguous parts so that the wear does not penetrate the surface hardness of the tubing either on the inside or the outside and thus a groove is not cut in the metal through this crust or surface hardness.

It is a further object of this invention to provide accurate mechanism for measured rotation of the tubing in predetermined decimal dimensions per stroke of the oil well pump.

It is a further object of this invention to provide multiple reduction of rotation by means of a ratchet wheel assembly added to a ring gear and pinion or a worm gear and worm drive.

Other objects and advantages of the invention

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will appear as the description of the invention and drawings proceeds.

Referring to the drawings in which I illustrate a preferred embodiment of my invention:

5 Figure 1 is a side elevation of an assembly of my invention with a bevel drive.

Figure 2 is a sectional view along 2-2 of Figure 1.

10 Figure 3 is a detailed elevation of the actuating ratchet and its actuating arm taken along the line 3-3 of Figure 2.

Figure 4 is an elevation of the back lash preventing ratchet taken along the lines 4-4 of Figure 2.

15 Figure 5 is a plan view along the lines 5-5 of Figure 2.

Figure 6 is an alternative drive mechanism utilizing a worm drive instead of a bevel drive. Figure 6 is a plan view of this alternative 20 construction.

25 Figure 7 is a sectional view along the lines 7-7 of Figure 6 showing the same view as Figure 2, except that a worm drive like that shown in Figure 6 is used instead of the bevel drive shown in Figure 2.

Referring to the drawings similar numbers are used to indicate the same parts throughout the drawings, and 10 indicates a usual walking beam which is supported on the conventional Sampson post 12 by the usual saddle 14. A horsehead 16 supports a bridle 18 which in turn is connected to the usual polish rod 20 which has below it the ordinary string of sucker rods which are not shown or given a separate number.

30 A customary stuffing box 22, flow line connection 24 and flow line 26 are illustrated in Figure 1 to orient the invention in the well pumping equipment. A swivel coupling 28 is provided to prevent rotation of the parts below it from affecting the parts above the usual nipple 30 is connected to a string of tubing not shown or numbered.

40 Turning now to the mechanism of my invention for rotating this nipple and the tubing I provide a ring gear 32 having set screws 34 which removably connect the ring gear 32 to the nipple 30. These set screws 34 perform the dual functions of effecting this connection between the ring gear 32 and the nipple 30 on the one hand and, on the other hand, adjusting the mesh of the pinion 36 with the ring gear 32 and thus they may be said to be combination holders and mesh 45 adjusters.

50 The pinion 36 is suitably mounted on the pinion shaft 38 which in turn is mounted on the front pinion shaft bearing holder 40 with its

oilite bearing 41 at the front end and the rear pinion shaft bearing cap 42 with its oilite bearing 44, both of which are held in place by the bearing cap bolt 43 shown in Figure 5. A pillow block bearing holder 46 serves to support the rear end of the pinion shaft.

Mounted beside the pillow block bearing holder 46 is the actuating arm bearing 48, the other end of which is the actuating arm 58. On the other side of the pillow block bearing holder 46 is mounted the back lash prevention mechanism which consists of the back lash preventing ratchet finger 49 which acts against the teeth of the back lash prevention ratchet wheel 50, urged by the action of spring 51. Calibrations 56 indicate the movement of back lash prevention ratchet wheel 50 and shouldered bolt 53 holds the back lash prevention ratchet finger 49 in place.

The pinion shaft 38 with its connected train of mechanism is actuated by the actuating ratchet wheel 54 which is keyed to the pinion shaft 38 by key 55. Calibrations 52 indicate the rotation of the actuating ratchet wheel 54 which has a hub 57 as is clearly shown in Figure 5. An actuating ratchet finger 60, similar in appearance to ratchet finger 49, is attached by shoulder bolt 62 to actuating arm 58 and is held by spring 64 in engagement with the ratchet teeth of actuating ratchet wheel 54. Rotation of actuating ratchet wheel 54 is effected by elevation of actuating arm chain 66 which in turn raises actuating arm 58 and causes actuating ratchet finger 60 to move actuating ratchet wheel 54 a circular distance equal to the proportion of the circumference of actuating wheel 54 that one ratchet of that wheel bears to the total number of ratchets on that wheel. In other words, each time that arm 58 is raised it moves actuating ratchet wheel in a circumferential direction a distance equal to one of its ratchets. This effects measured rotation of pinion shaft 38, its connected pinion 36, ring gear 32, nipple 30 and the tubing attached integrally to nipple 30. It is obvious therefore that the amount of rotation of the tubing depends upon the size and number of teeth in actuating ratchet wheel 54.

Movement of actuating arm 58 through actuating arm chain 66 is effected by action of walking beam 10 to which the other end of actuating arm 66 is connected as is seen in Figure 1. Thus actuating ratchet wheel 54 moves one ratchet circumferentially every time that walking beam 10 makes a complete movement.

This power train is supported on pillow block bearing base 68 which is connected by base bolts 70 to housing flange 77. A flanged top 72 is connected by housing top bolts 74 to housing 76 which has a flange 77. This housing flange 77 is bolted by well head flange bolts 78 to well head flange 80 as is shown in Figure 2. Housing flange 77 and well head flange 80 are sealed by O ring 79 between them. O rings 82 seal the nipple 30 and the flanged top 72 and O ring 84 effects a seal between flanged top 72 and housing 76.

A tubing actuating spinner plate 86 is welded to nipple 30 and mounted on top ball race 88 which in turn rests on ball bearings 90, which are supported by bottom ball race 92.

In the variation of my invention shown in Figure 2 with the pinion drive I provide a self-aligning bearing ring 94 which has a radial contact 96 between it and the bottom of the bottom ball race 92. A downwardly facing shoulder 98 in spinner plate 86 and an upwardly facing

shoulder 100 in housing flange 77 receive and contain the ball race assembly in order to make and maintain the races concentric and registering with each other.

In the alternative construction shown in Figures 6 and 7 I substitute for the pinion drive means a worm drive consisting of worm gear 102 which is driven by worm 104, connected to worm shaft 106 and worm hub 108. A key 110 connects worm shaft 106 to worm hub 108. Bolts 112 connect worm gear 102 with spinner plate 86 and bolts 114 connect housing 76 to housing flange 77.

It is noted that self-aligning bearing ring 94 with its radial surface contact 96 is omitted from the worm gear structure shown in Figures 6 and 7 in which bottom ball race 92 is substantially a one piece construction of bottom ball race 92 and self-aligning bearing ring 94 as shown in Figure 2.

The mode of operation of my invention is obvious from my drawings and is very simple. Each time that walking beam 10 is raised it also raises polish rod 20 and its attached string of sucker rods together with actuating arm chain 66. This elevation of actuating arm chain 66 raises actuating arm 58 which causes actuating ratchet finger 60 to rotate actuating ratchet wheel 54 a circumferential distance equal to the proportion of the circumference that one ratchet bears to the total number of ratchets in the circumference of wheel 54. Thus the exact amount of rotation for each elevation of walking beam 10 can be accurately predetermined to a decimal dimension. This rotation of actuating ratchet wheel 54 effects a similar rotation through a similar percentage of the complete rotation cycle of pinion shaft 38 due to the keyed connection 55 between pinion shaft 38 and actuating ratchet wheel 54. This rotation of pinion shaft 38 effects proportionate rotation of pinion 36 and ring gear 32. This rotation of ring gear 32 effects proportionate rotation of nipple 30 and its attached string of tubing through the connection 34 between ring gear 32 and nipple 30. By this train of mechanism the tubing attached to nipple 30 is rotated an exact dimensional amount each time that walking beam 10 is raised.

Back lash rotation or rotation in a reverse direction of the tubing is prevented by the back lash prevention assembly shown in Figure 4 which operates in an obvious manner. Back lash prevention ratchet wheel 50 is integrally connected to pinion 36 and hence through ring gear 32 and nipple 30 with the tubing connected to nipple 30. When this tubing attempts to rotate in the opposite direction after it has been moved forward by the mechanism described above this back lash will be prevented and arrested by the ratchets on back lash prevention wheel 50 engaging back lash prevention ratchet finger 49 which is pivotally mounted on shouldered bolt 53 and held in engagement with the ratchet teeth of wheel 50 by spring 51. In this connection it is to be noted that there are more ratchet teeth in back lash prevention ratchet wheel 50 than there are in actuating ratchet wheel 54. This is done to make sure that all back lash is prevented as there might be an overlap if there was more circumferential rotation permitted by the back lash prevention mechanism than by the actuating ratchet mechanism. My casing head is easily and readily attached to the standard flanged well head 80, which is provided on all wells, by the simple operation of bolting housing flange 77 to

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well head flange 80 by means of bolts 78. Set screws 34 may then be adjusted to hold nipple 30 and to make the proper mesh engagement between ring gear 32 and pinion 36. In the variation shown in Figures 6 and 7 utilizing a worm drive instead of a pinion drive housing flange 77 is similarly bolted to well head flange 80 by bolts 78 and decimal dimensional rotation of nipple 30 is effected by actuation of the worm gear the desired controlled amount. Actuation of the worm gear rotates the tubing actuating spinner plate 86 which is bolted to it by bolts 112. The tubing actuating spinner plate 86 is welded integrally to the nipple 30 so rotation of the tubing actuating spinner plate 86 effects similar rotation of the nipple 30 and its attached string of tubing. In the variation shown in Figure 2 of the drawings spinner plate 86 is also welded and integrally attached to nipple 30 but it is actuated by rotation of nipple 30 and serves as a connection between nipple 30 and the top ball race 88 upon which tubing actuating spinner plate 86 rests.

While I have shown and described in some detail two presently preferred embodiments of my automatic tubing rotator it is to be understood that various modifications may be made in the construction and operation thereof within the scope of the subsequently claimed invention.

I claim:

Tubing rotating mechanism for a well apparatus including a casing within the well and a tubing within the casing extending upwardly

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above the upper end of the casing, said mechanism comprising a housing having a flanged base secured to the upper end of the casing and surrounding the tubing, a spinner plate fixed to the tubing, an antifriction bearing positioned between said spinner plate and the flanged base of said housing for supporting and permitting rotation of the tubing, a driven gear secured to said tubing coaxially therewith, a shaft journaled in bearing supports carried by said housing, a driving gear secured to said shaft in meshing engagement with said driven gear, said gears affording a reduction of speed of rotation of said tubing relative to said shaft, a toothed ratchet wheel secured to said shaft, an actuating arm pivotally mounted on said shaft, a ratchet finger on said arm for engagement with the teeth of said ratchet wheel for intermittent unidirectional rotation of said shaft upon oscillation of said arm, and means for oscillating said arm.

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