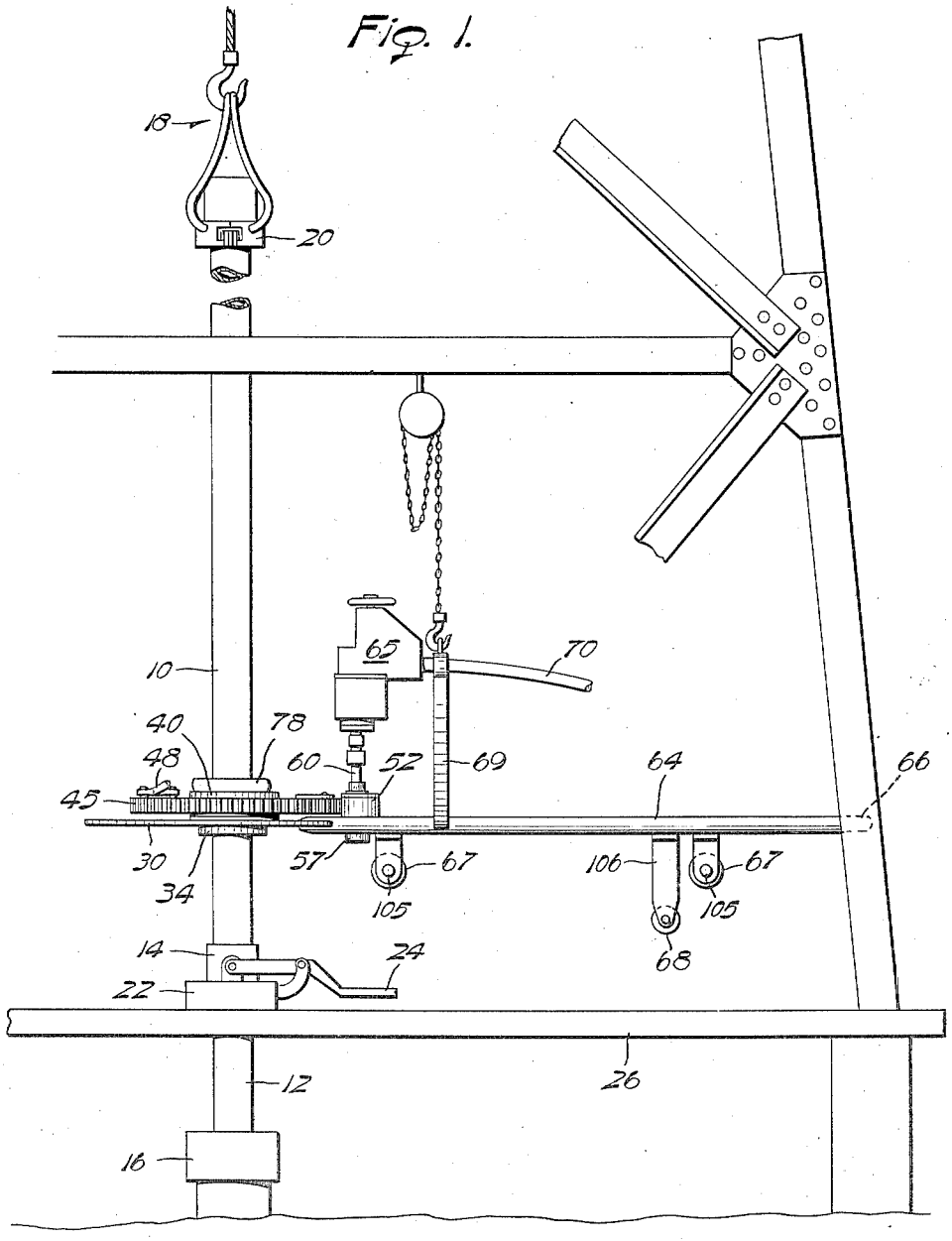
May 30, 1950 N. K. WILSON 2,509,853

TUBING AND ROD HANDLING TOOL

Filed May 20, 1947 3 Sheets-Sheet 1

Fig. 1.



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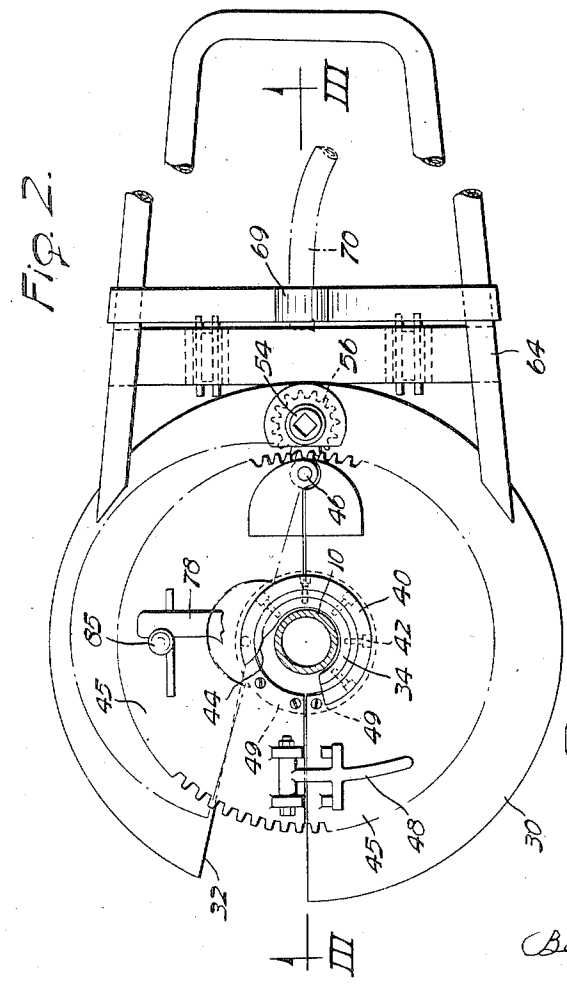


Fig. 2.

Fig. 3.

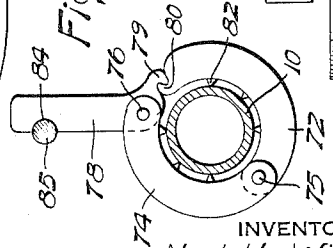


Fig. 4

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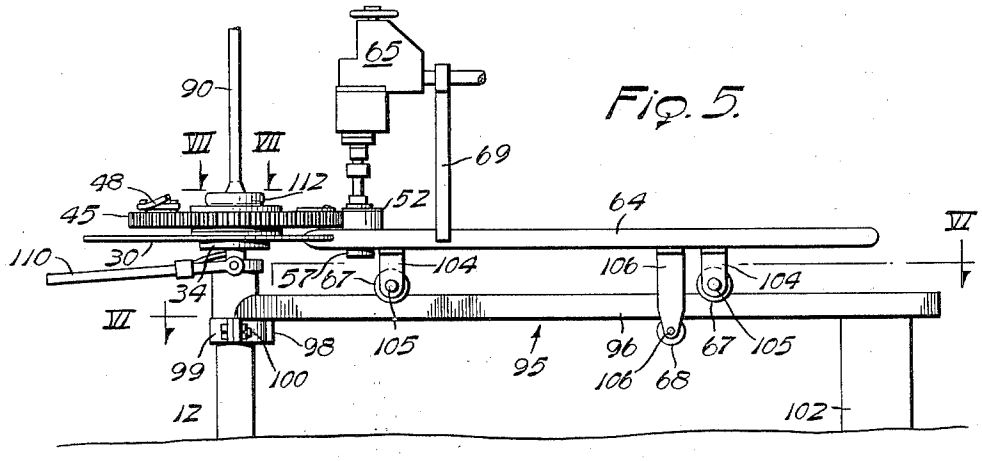


Fig. 5.

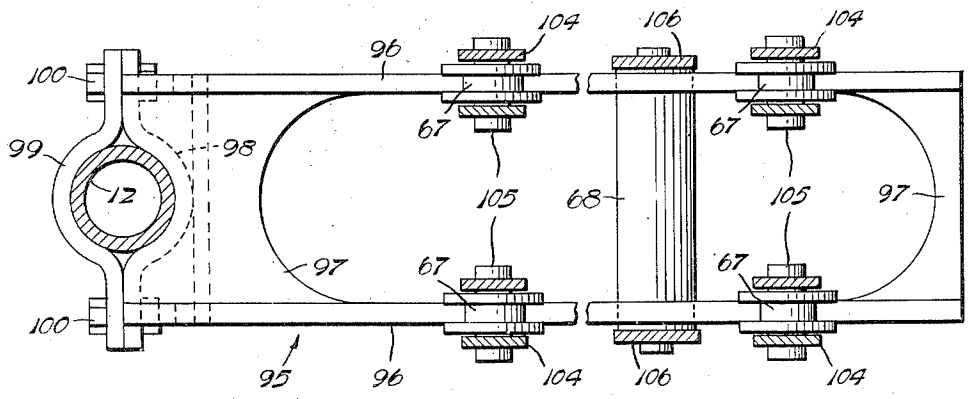


Fig. 6.

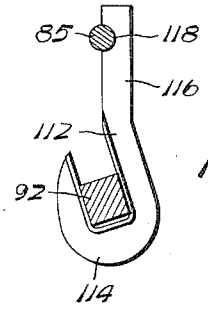


Fig. 7.

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TUBING AND ROD HANDLING TOOL

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Application May 20, 1947, Serial No. 749,397

3 Claims. (Cl. 255—35)

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This invention relates to an improvement in tools for handling well tubing, and well sucker rods, and the like; and more particularly to a tool of improved structural simplicity and facility for handling in connection with the work of coupling and uncoupling lengths of screw-threaded well tubing and sucker rods or other screwthread connected devices in the oil well business and the like.

Heretofore, the operations of coupling and uncoupling casing or tubing or sucker rod sections in connection with the operations of installing or "pulling" them from wells, have been largely accomplished by manual manipulations of large and cumbersome tools; and even though in some instances power driven tools have been designed for such purposes, these tools have been so cumbersome and difficult to manage that such work has been extremely laborious and a relatively large crew of workmen have been required to manage such equipment under dangerous and uncomfortable operating conditions. Also, previous arrangements for the above stated purposes have invariably involved undesirable mechanical complications with the result that the operations of installing and "pulling" well casings and rods have been extremely tedious and slow and costly.

A primary object of the present invention is to provide an improved tool for handling well casings and rods and the like; said tool being light-weight and easily carried by one man to and from the installation or pulling operations. Another object is to provide a tool for the purpose described which is operable to enable a workman to complete the necessary coupling and uncoupling operations without the use of a helper crew. Another object of the invention is to provide a device of the character described which is of improved structural simplicity so as to be of improved ruggedness and effectiveness in operation while being adapted to be inexpensively manufactured. Another object of the invention is to provide a tool of the character aforesaid which is of such light weight as to be portable with improved facility from operation to operation. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawings:

Fig. 1 is a general view in elevation of a tool of the invention mounted upon a well tubing in connection with a casing coupling or uncoupling operation;

Fig. 2 is a fragmentary top plan view, on a

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larger scale, of the tool of the invention, with the power supply motor removed and the tubing gripping portion of the tool broken away;

Fig. 3 is a section, on an enlarged scale, as along line III—III of Fig. 2;

Fig. 4 is a top plan view of the tubing gripping portion of the tool which is broken away from Fig. 2;

Fig. 5 is a side elevational view showing the tool of the invention mounted upon a well casing and arranged for well sucker rod operational purposes;

Fig. 6 is a section, on a larger scale, taken along line VI—VI of Fig. 5; and

Fig. 7 is a fragmentary section, on an enlarged scale, taken along line VII—VII of Fig. 5.

The invention is illustrated in Figs. 1–4 of the drawing in connection with a well tubing comprising an upper section 10 and a lower section 12 interconnected by means of a screwthreaded sleeve 14; the tubing section 12 being illustrated as emerging from a well collar 16. The upper tubing section is illustrated as being suspended from a tackle device 18 having any suitable type casing clamp or grip 20. A toggle clamp device 22 is shown in connection with the lower pipe section 12; and thus it will be understood that the clamp 22 may be manually operable as by a handle 24 so as to alternately grip and release the tubing. The clamp 22 is arranged to ride upon any suitable platform or base structure 26 forming a part of the well derrick, and thus it will be understood that the well tubing may be alternately gripped by the clamps 20—22 coincident with alternate raising and lowering of the tackle device 18 so as to obtain intermittent raising or lowering displacements of the tubing.

Thus, for lowering a string of tubing into the well, a first section will be initially lowered by the tackle 18 into the well as to the position occupied by the tubing section 12 in Fig. 1, whereupon the clamp 22 will be adjusted thereon so as to hold the tubing section in suspension relative to the platform 26. The tackle 18 will then be disconnected and moved to pick up another section of the tubing which will then be elevated into an upright position, as in the attitude occupied by the tubing section 10 in Fig. 1; the lower end of the upper tubing section being guided into alignment with the collar 14 on the upper end of the lower tubing section. The upper tubing section is then introduced into the collar 14. In order to rotate the upper tubing section 10 so as to provide a firm connection between the tubing sections, the tool of the present inven-

tion is applied to the upper tubing section in such manner that when power is applied to the tool it will cause the upper section to rotate in the proper direction.

As shown herein, the tool of the invention comprises a base plate 30 which is of generally circular planiform except for a segmental cut-out portion indicated at 32 which permits the base plate to be slip-fitted laterally relative to the tubing so as to dispose the latter at the center of the base plate. The latter is circularly recessed at its center portion and fitted with a parti-cylindrical sleeve 34. The sleeve 34 may be welded as indicated at 35 or otherwise rigidly fixed to the base plate 30 to extend vertically therein to receive the well tubing section 10. Exteriorly thereof, the sleeve 34 is fitted with an annular bearing 36 which includes a bottom flange portion 38 and a top flange prtion 40 which is detachably fixed to the bearing body 36 by means of screws 42. The bearing and flange elements are cut away at one side as indicated at 44 (Fig. 2) so as to permit the base plate and bearing unit to be laterally displaced from exteriorly of the well tubing so as to embrace the latter within the sleeve portion 34.

A gear wheel unit comprising a pair of gear half sections 45—45 are hingedly interconnected as indicated at 46. Complemental portions of a suitable toggle clamp device 48 are carried by the respective half sections of the gear wheel unit, and the gear wheel sections are half-round recessed at their centers so as to fit freely around the bearing body 36 when the gear sections are clamped together by the lock 48. The gear wheel sections 45—45 carry semi-circular bearing blocks 49 which are so dimensioned and arranged so as to ride in bearing relation against the bearing body 36 and the bottom flange portion 38, while the upper inner edge portions of the gear wheel sections ride in bearing relation under the top flange 40 (Fig. 3).

The base plate 30 mounts a bearing housing 52 at one edge thereof, and a jack shaft 54 carrying a spur gear 56 is mounted within the housing 52 by means of bearing sleeves 57—58. The upper end of the jack shaft 54 is socketed so as to receive in geared relation therein a power supply shaft 60 extending from a compressed air motor 65; and the spur gear 56 is so arranged as to mesh with the gear wheel unit 45—45 whenever the latter is locked in assembled relation upon the bearing 36. A tubular frame 64 is welded or otherwise firmly attached to the base plate 30 so as to extend radially therefrom to provide a handle to facilitate positioning of the tool relative to the work. Thus, the structure 64 provides a convenient handle extension which may be grasped by the operator when arranging the tool relative to the work; and preferably the handle structure 64 will be so dimensioned as to extend as indicated at 66 (Fig. 1) into abutting relation against any suitable adjacent portion of the derrick frame work, whereby the base plate portion of the tool unit may be blocked by the derrick frame work against rotation incidental to screwthreading rotations of the well casing sections. Rollers 67 and 68 are provided on the frame 64 for purposes which will be explained hereinafter. A vertical extension 69 is provided on the handle structure to support the upper end of the power supply motor 65; and as illustrated in the drawing the compressed air supply hose 70 which feeds the motor may be conveniently threaded through an apertured portion of the bracket structure 68.

A pipe clamp device comprising a pair of jaws 72—74 (Fig. 4) pivotally connected at 75 are arranged to encircle the upper tubing section 10. The jaw 74 is pivotally connected at 76 to a lever 78 which is formed with a nose end portion 79 shaped to engage a reversely turned nose end portions 80 of the jaw 72; and the parts are so arranged that upon pivoting of the lever 78 relative to the fulcrum 76 in clockwise direction as viewed in Fig. 4 the jaws 72—74 will be caused to squeeze inwardly against the tubing 10 disposed therewithin. The jaws 72—74 are formed with teeth 82 to enable the clamp device to obtain a torsionally rigid grip upon the tubing 10.

The lever arm 78 is recessed as indicated at 84 to adapt the latter to receive in cradled relation therein a pin 85 which is welded or otherwise rigidly fixed to one of the gear portions 45 to extend uprightly therefrom. The pin is disposed so as to come into registry with the recessed portion 84 of the lever 78 when the gear wheel unit 45—45 is clamped in operating position upon a section of well tubing, and when the pipe clamp unit 72—74—78 is arranged in clamping relation upon the tubing. Thus, as the lever arm 78 extends radially from the well tubing, whenever power is applied through the motor 65 to the gear wheel 45—45 so as to rotate the latter for example in clockwise direction as illustrated in Fig. 2, the pin 85 will be carried by the gear wheel so as to engage within the recessed portion of the lever arm 78, and to bear against the latter so as to drive the lever also in clockwise direction. Thus, the upper tubing section 10 is caused to rotate in clockwise direction as viewed from thereabove, while the lower tubing section 12 is being held against rotation by the clamp device 22. This mode of operation of the tool of the invention will therefore be employed to cause the tubing sections and the sleeve 14 to be driven into screwthread coupled relation.

It will of course be understood that any suitable motor control arrangement may be employed in connection with the motor 65, such as a manually operable valve or the like controlling the flow of compressed air to the motor. Preferably, the motor 65 will be of directionally reversible type so that tubing coupling and uncoupling operations may be effected by simply reversing the motor control valve. Whenever it is desired to employ the tool for uncoupling previously connected tubing sections, before power is applied to the tool the upper clamp device will be opened and withdrawn from the tubing and then turned over and reapplied to the tubing so that the lever arm 78 faces the pin 85 at the opposite side thereof. Then upon counterclockwise rotation of the gear wheel unit 45—45, in response to proper control of the motor 65, the pin 85 will be carried by the gear wheel to drive the clamp lever arm 78 in counterclockwise direction. Hence through the grip of the clamp upon the tubing section 10 the latter will be rotated so that the screwthreaded portions of the tubing and sleeve elements will become uncoupled. In any case it will be understood that the recessed portion 84 of the lever arm 78 will cooperate with the pin 85 to maintain the lever arm 78 in proper position radially of the mounted tubing section, so that the toggle clamp elements of the upper tubing clamp will remain at all times in proper relation so that driving pressures exerted by the gear wheel 45—45 will be translated into increasingly firm gripping forces

by the upper clamp against the upper tubing section.

It will be understood that this optimum gripping operation is obtained by reason of the arrangement of the invention which provides a casing clamp device comprising a minimum number of parts, and which is so light-weight and adapted to be easily handled for application to the tubing in reverse directions, and automatically operable at all times for the purpose intended without likelihood of disconnection or slippage relative to the tubing.

Thus, it will be understood that the tool of the invention comprises a relatively light-weight bass portion comprising a frame which is adapted to be slip-fitted at one end into embracing relation about a well tubing section or the like while the later is disposed in vertical attitude; the frame having a split gear wheel unit thereon which is adapted to be opened at one side to permit entrance of the mounted tubing section into the central bearing portion of the gear wheel, whereupon the gear wheel is reclosed and locked in concentric bearing relation about the tubing. The other end of the tool frame then extends horizontally for tieing to some convenient stationary structure, and provision is made on the frame for mounting a power supply motor in operative connection with the gear wheel unit. The second element of the tool unit of the invention comprises a toggle clamp device which is adapted to enclose about the mounted casing section; the lever arm portion of the toggle clamp being thereby disposed to extend radially from the casing section so that a recessed portion of the clamp lever engages a fixed abutment on the gear wheel unit. The fixed abutment and the toggle clamp elements are so constructed and arranged that subsequent to assembly of the tool unit in operative position, and upon application of power to the gear wheel unit the latter will be thereby driven to rotate about the mounted tubing section so as to drive the toggle clamp to cause the mounted tubing section to rotate. In all cases the abutment device and the toggle clamp elements cooperate to maintain the toggle clamp elements in proper position for optimum gripping and driving of the mounted tubing section. Thus, all of the elements of the tool are readily manageable by a single workman, and the upper clamp is easily reversible for alternate coupling and uncoupling operations; the tool parts being so constructed and arranged that readjustments of the upper clamp and directional control arrangements provide no difficulty and require no particular care on the part of the operator in order to obtain fool-proof operation of the machine.

Figs. 5–6–7 illustrate the tool of the invention as being arranged for the operations of unscrewing or screwing together the sections of a well sucker rod such as is normally employed in a well to operate the pump located in the bottom of the casing. In the drawing the sucker rod is designated 90 and comprises a series of rod lengths each of which terminates at opposite ends in screwthreaded socket and stud portions for series interconnection to provide the sucker rod assembly. Adjacent their ends, the sucker rod pieces are each formed with enlarged square-sectioned body portions as indicated at 92 (Figs. 5 and 7) so as to enable wrench devices to grip thereon, so that joining screwthreaded portions of adjacent rods may be gripped by appropriate tools and relatively rotated for screwing or unscrewing operations.

To adopt the tool of the present invention to the work of unscrewing or screwing together the sucker rod pieces whenever it is desired either to assemble the sucker rod and lower the pump into the well or to "pull" the pump, a track unit 95 is provided as shown in Figs. 5–6. The track unit comprises a pair of side rails 96—96 arranged to extend in parallel relation and interconnected by transverse spacer plates 97—97. At one end the track unit terminates in a yoke piece 98, and a saddle clamp 99 shaped complementary to the yoke piece 98 is arranged to be bolted or otherwise detachably fixed to the yoke 98, as by means of bolt and nut connections 100—100. The yoke and clamp pieces 98—99 are so shaped and dimensioned as to embrace and firmly clamp upon the well casing 12 when the nut devices 100 are tightened, and to thereupon support the track unit 95 to extend horizontally in cantilever mounted fashion from the well casing. If desired, a suitable block 102 (Fig. 5) may be set under the outer end of the track unit 95 to vertically brace the track unit.

The track rails 96—96 are arranged to receive the rollers 67 of the tool frame 64; the rollers 67 being mounted under the frame 64 by means of U-brackets 104 and axles 105. The roller 68 is arranged to extend transversely under the rails 96—96 and therebeyond at opposite sides of the track structure, and is suspended at its opposite ends from the frame 64 by means of brackets 106. Thus, after the track unit 95 is mounted upon the casing 12, the tool may be rolled onto the track from its outer end and into sucker rod engaging position as illustrated in Fig. 5. As the tool approaches sucker rod engaging position, the split gear unit 45 will be opened (as shown in Fig. 2), so as to permit that portion of the tool to come into sucker rod encircling position. The gear unit will then be closed and locked as explained hereinabove.

As shown in Fig. 5, a standard form of "elevator" tool designated 110 is first applied to the sucker rod assembly such as is conventionally employed for gripping and elevating the sucker rod assembly when lowering or "pulling" the pump. As is well known in the art, this "elevator" is arranged to alternately grip and raise or lower the string of sucker rod sections, and to lock the string at various elevated positions while adjacent rod sections are unscrewed or screwed together. When the elevator handle 110 is forced down to the horizontal position thereof shown in Fig. 5 the cam device of the tool locks the tool on the sucker rod, and hence the rod is held suspended from the top of the casing 12. At the same time the elevator tool 110 grips the lower sucker rod section and holds the latter against rotation while screwing or unscrewing forces are applied to the next adjacent rod section thereabove.

When the tool of the invention is applied to the sucker rod assembly 90 for coupling or uncoupling thereof, a wrench device as illustrated at 112 (Fig. 7) is employed in conjunction with the gear and pin unit 45—85 in lieu of the wrench illustrated in Fig. 4 which is used in conjunction with tubing coupling and uncoupling operations. The wrench 112 of Fig. 7 comprises a rectangularly socketed jaw 114 and a handle portion 116 which is notched at 118 so as to register with the gear pin 85. Thus, when the gear 45 is driven to rotate by the motor 65, the pin 85 drives the wrench 112 so as to rotate the upper sucker rod section relative to the sucker rod section there-

below which is gripped by the elevator wrench 110. Of course it will be understood that the elevator wrench 110 may be conveniently held or blocked against coincident rotation by the frame 95.

Thus, it will be understood that when the tool of the invention is mounted upon the track unit 95 it is maintained thereon by the rollers 67—68, while being free to be rolled toward and away from engagement with the sucker rod assembly; and that the tool of the invention therefore comprises a conveniently manipulated device which is adapted both to tubing and sucker rod handling operations. It is a particular feature that the tool is so constructed and arranged that a small crew may relatively easily assemble and disassemble the tool relative to the work and conduct both tubing and sucker rod assembling and disassembling operations with utmost speed and ease and safety.

Although only one form of the invention has been shown and described in detail it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A tool for handling well tubing and pump sucker rods and the like, said tool comprising a frame having roller means thereon adapting the frame to roll upon a track device, a track device having clamp means at one end thereof for detachable connection upon a well casing so as to extend the track device in cantilever mounted relation thereon, a generally circular base plate rigidly fixed to one end of said frame, said base plate being centrally bored and being laterally recessed from the periphery thereof into the central bore thereof so as to be adapted to straddle a well tubing or pump sucker rod section with the latter disposed to extend through the central bore of said base plate, said base plate carrying cylindrical bearing means concentrically of the central bore thereof, a split gear comprising complementary parts constituting an annular gear with said parts hingedly interconnected at one side of the gear closely adjacent the periphery thereof and having interconnecting latch means at a position opposite said hinge means for locking the gear together to form a solid circular gear mounted to rotate upon said bearing means, a spur gear rotatably mounted upon said frame and in mesh with said gear and arranged to receive in driving connection therewith a portable power source for driving said gear to rotate upon said bearing means, a wrench having a jaw portion adapted to grip the tubing or rod section to be rotated and having an arm portion extending from said jaw portion, and means extending from said gear to engage said wrench arm portion for rotating said wrench with said gear.

2. A tool for handling well tubing and pump sucker rods and the like, said tool comprising a frame having means thereon adapting the frame to roll upon a track device, a track device for detachable connection upon a well casing so as to extend in cantilever mounted relation thereon, said frame having a base plate rigidly fixed to one end thereof, said base plate being centrally bored and laterally recessed from the periphery thereof into the central bore thereof so as to be adapted to straddle a well tubing or pump sucker rod section with the latter disposed to extend through the central bore of said base plate, said base plate carrying bearing means, a split gear comprising complementary parts constituting an annular gear with said parts hingedly interconnected at one side of the gear and having interconnecting latch means at a position opposite said hinge means for locking the gear together to form a solid gear mounted to rotate upon said bearing means, a spur gear rotatably mounted upon said frame and in mesh with said gear for driving the latter to rotate upon said bearing means, means adapting said spur gear to be connected to a device for driving the latter to rotate, a wrench having a jaw portion adapted to grip the tubing or rod section to be rotated and having an arm portion extending from said jaw portion, and means extending from said gear to engage said wrench arm portion for rotating said wrench with said gear.

3. A tool for handling well tubing and pump sucker rods and the like, said tool comprising a frame adapted for detachable connection upon a well casing so as to extend in cantilever mounted relation thereon, said frame having a generally circular base plate rigidly fixed to one end of said frame, said base plate being centrally bored and laterally recessed from the periphery thereof into the central bore thereof so as to be adapted to straddle a well tubing or pump sucker rod section with the latter disposed to extend through the central bore of said base plate, said base plate carrying cylindrical bearing means concentrically of the central bore thereof, a split gear comprising complementary parts constituting an annular gear with said parts hingedly interconnected at one side of the gear closely adjacent the periphery thereof and having interconnecting latch means at a position opposite said hinge means for locking the gear together to form a solid circular gear mounted to rotate upon said bearing means, a spur gear rotatably mounted upon said frame and in mesh with said gear for driving the latter to rotate upon said bearing means, a portable motor supported by said frame and connected to said spur gear for driving the latter to rotate, a wrench having a jaw portion adapted to grip the tubing or rod section to be rotated and having an arm portion extending from said jaw portion, and means extending from said gear to engage said wrench arm portion for rotating said wrench with said gear.

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