

June 21, 1966

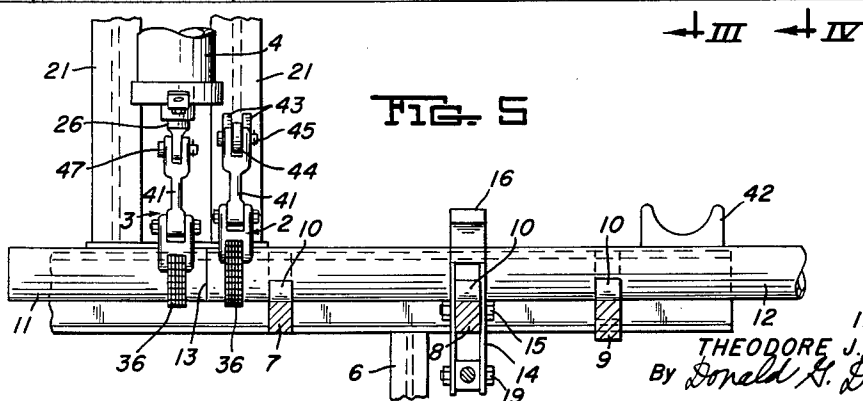
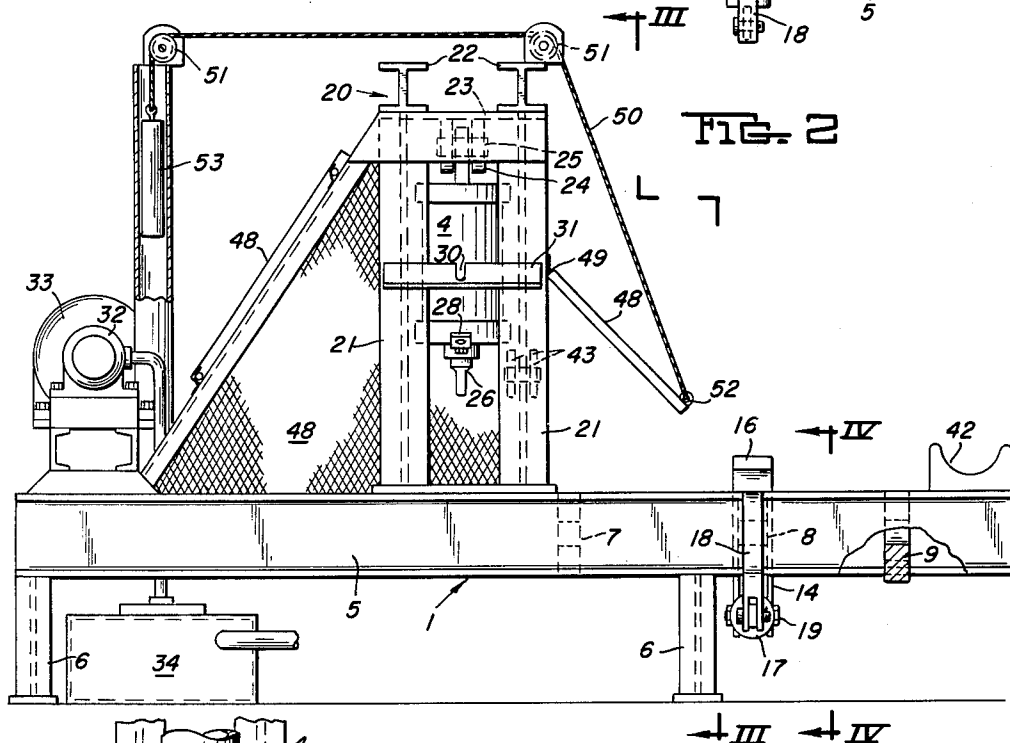
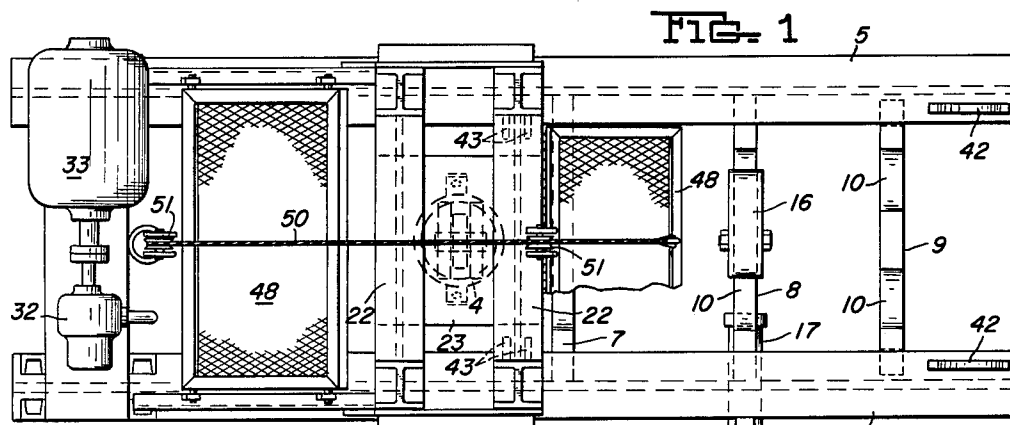
T. J. KOCHAVER

3,256,757

POWER WRENCH FOR BREAKING THREADED JOINTS

Filed Jan. 15, 1963

2 Sheets-Sheet 1



INVENTOR
THEODORE J. KOCHAVER
By *Donald H. Dalton*
Attorney

June 21, 1966

T. J. KOCHAVER

3,256,757

POWER WRENCH FOR BREAKING THREADED JOINTS

Filed Jan. 15, 1963

2 Sheets-Sheet 2

FIG. 3

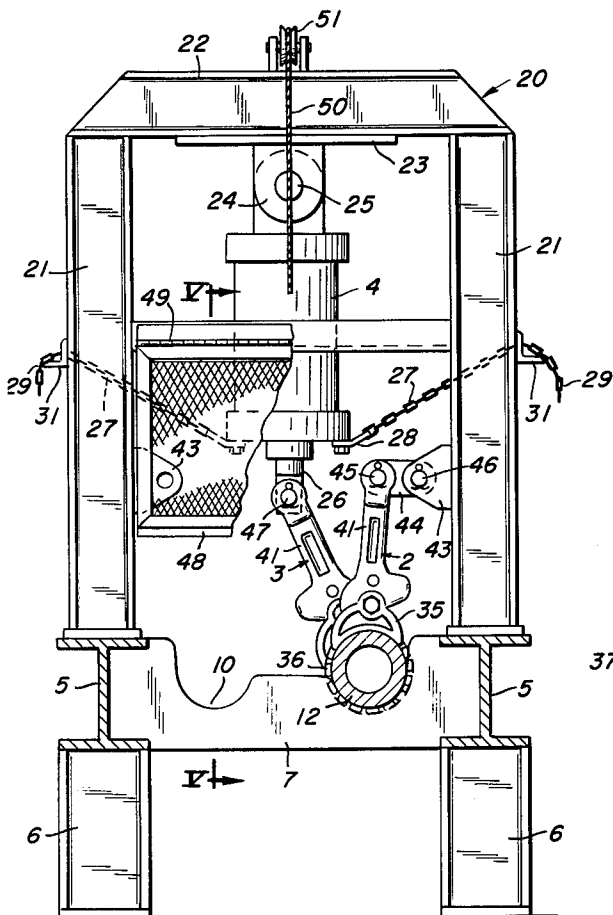


FIG. 6

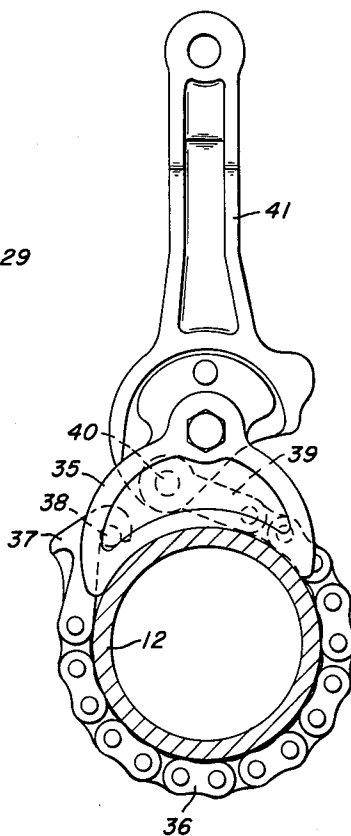
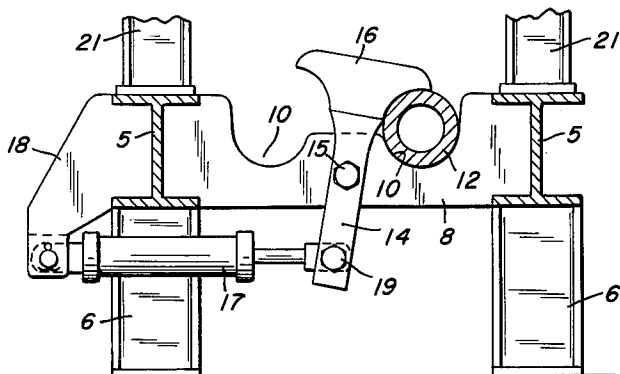


FIG. 4



INVENTOR
THEODORE J. KOCHAVER
By *Donald L. Dalton*
Attorney

1

2

3,256,757

POWER WRENCH FOR BREAKING THREADED JOINTS

Theodore J. Kochaver, Virginia, Minn., assignor to
United States Steel Corporation, a corporation of Dela-
ware

Filed Jan. 15, 1963, Ser. No. 251,582
4 Claims. (Cl. 81-54)

This invention relates to a power wrench which, although capable of general application, is especially suited for making and breaking threaded joints in earth drilling equipment.

The threaded joints in earth drilling equipment for which this invention is particularly adapted are those that connect drill-bits or hammers to drill stems as well as those between the sections of rod or pipe in the drill stem. During drilling operations such joints work very tight and are consequently difficult to disassemble when a drill is withdrawn from a hole. While power apparatus for breaking such joints has been proposed, previously available forms thereof have been subject to several disadvantages such as, for example, complicated construction, difficulty in applying them to the threaded joint to be disassembled, and insufficient power to break the threaded connection to which they may be applied. One of the objects of this invention, accordingly, is to provide a power wrench that overcomes these disadvantages.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawings, in which:

FIGURE 1 is a plain view of a preferred embodiment of the apparatus of this invention;

FIGURE 2 is a side elevation thereof;

FIGURE 3 is a view taken substantially along the line III—III of FIGURE 2, but showing two sections of a drill stem with pipe tongs or chain wrenches assembled thereon.

FIGURE 4 is a fragmentary view similar to FIGURE 3 but taken substantially along the line IV—IV of FIGURE 2;

FIGURE 5 is a fragmentary sectional and elevational view taken substantially along the line V—V of FIGURE 3; and

FIGURE 6 is an enlarged detail showing of one of the wrenches that forms a part of the apparatus shown in FIGURE 3.

Generally stated, the apparatus of this invention comprises a base frame 1 in the form of a cradle for supporting the parts of a threaded joint to be tightened or loosened, a pair of wrenches 2 and 3 of identical construction for gripping engagement with the work on opposite sides of the threaded joint formed thereby, and a fluid pressure motor 4 that operates in a manner to be described to make or break the threaded joint. Threading rotation of the parts forming the joint is effected by anchoring the wrench 2 against rotation on the frame 1 and operating the motor 4 to rotate the wrench 3. In this manner, the wrenches 2 and 3 operate to rotate the parts engaged thereby relative to each other and thus make or break the threaded joint by which they are connected.

The base frame 1 comprises a pair of laterally spaced horizontal side beams 5 that are supported in an elevated position by legs 6. Three saddle brackets 7, 8 and 9 extending transversely between the side beams 5 in position at points spaced longitudinally thereof furnish a cradle-support for the work engaged by the wrenches 2 and 3. Each of these brackets has a pair of laterally spaced recesses 10 in which the work is received and supported in either of two laterally spaced positions respectively adjacent the side beams 5 for a purpose to be described. As shown in FIGURE 5, the work for purposes

of illustration comprises two sections 11 and 12 of drill pipe that are connected by a threaded joint at 13. At least one of the saddle brackets 9 has a slide support on the beams 5 so that its position may be adjusted thereon according to the length of the work to be supported. The center bracket 8 has a stabilizer bar 14 pivotally supported thereon by a centrally located pivot 15 so that its upper end 16 may be swung in opposite directions toward either of the recesses 10. The stabilizer bar upper end 16 is shaped in the form of a double-hook for engaging and holding the pipe section 12 securely in the saddle bracket recesses 10 in which it is supported. Swinging movement of the bar 14 in opposite directions to move the hook 16 into holding engagement with the work is effected by a double-acting fluid pressure motor 17 that has one end pivotally supported by a bracket 18 on one of the side beams 5 and a piston-rod projecting from its other end pivotally connected at 19 to the lower end of the bar 14.

The motor 4 is suspended in a centrally located and vertical position over the frame 1 by a second frame 20, which comprises a pair of column beams 21 projecting upwardly from each of the side beams 5, and a pair of horizontal beams 22 extending between the upper ends of the beams 21. A motor mounting plate 23 is welded to the lower edges of the beams 22 and furnishes a support from which the motor 4 is suspended by a pin and clevis connection 24, which includes a pivot pin 25 that provides for pivotal movement of the motor 4 about an axis parallel to and arranged centrally between the side beams 5. A piston rod 26 projecting from the lower end of the cylinder of the motor 4 is connected to the wrench 3 in a manner to be described. A pair of chains 27 provide for adjusting the angular position of the motor 4 about the axis of the pin 25 and to hold it against swinging movement when it is being connected to the wrench 3. For this purpose, the inner ends of the chains 27 are connected by brackets 28 with the lower end of the motor 4 and their outer ends 29 are detachably hooked in notches 30 in angle brackets 31 that have opposite ends thereof secured to the column beams 21. After connection with the wrench 3 has been made, the chains 27 are disengaged from the bracket notches 30 to release the motor 4 for free swinging movement during its operation to rotate the wrench 3.

The motor 4 is preferably an hydraulic motor. Hydraulic fluid for effecting its operation is supplied through conduits (not shown) by a pump 32 driven by an electric motor 33 both mounted on one end of the frame 1. The fluid circuit between the motor 4 and pump 32 includes a reservoir 34 and conventional valve mechanism (not shown) controlling the admission and exhaust of fluid of the motor 4 with respect to the pump 32 and reservoir 34.

The wrenches 2 and 3 are pipe wrenches of the chain type commonly called drill-pipe tongs. Since their construction is conventional, it will be sufficient to indicate that each comprises, as shown in FIGURE 6 of the drawings, an arcuate clamping shoe 35 that is placed in engagement with a pipe to be rotated thereby, a clamping chain 36 that has a hook 37 at one end thereof for connection with a lug 38 on the shoe 35, and a link 39 at its other end that has a pivotal connection 40 with an operating handle 41. When the handle 41 is pulled to the right as viewed in FIGURE 6, the clamping pressure of the shoe 35 and chain 36 with the work is increased and the wrench is rendered effective to rotate the work piece or pipe with which it is engaged in a clockwise direction.

FIGURES 3 and 5 of the drawings show the wrenches 2 and 3 applied to the two sections of drill pipe 11 and 12 mentioned above in position adjacent the joint 13 therebetween. To facilitate assembly of the wrenches 2

3

and 3 on the drill pipe in this manner, the frame 1 has two supporting brackets 42 respectively mounted on the ends of the beams 5 and on which a drill stem assembly comprising the sections 11 and 12 may be temporarily supported in a position extending transversely of one end of the frame 1. After the wrenches are applied in this manner, the work is removed from the brackets 42 and turned to a position supported on the brackets 7, 8 and 9 of the frame 1, these operations being performed by a crane-hoist. When the work is placed on the supporting brackets 7, 8 and 9 in this manner, it is moved to a position with the threaded joint 13 arranged centrally between the motor piston rod 26 and pairs of anchoring lugs 43 secured to each of the columns 21 at the right of the frame 20 as viewed in FIGURES 1 and 2. This location of the threaded joint 13 places the wrenches 2 and 3 in a position for connecting their handles 41 respectively to the motor 4 and with the frame 20. An anchoring connection for the wrench 2 with the frame 20 is provided by a link 44 that has pivotal connections 45 and 46 as its opposite ends respectively with the handle 41 of the wrench 2 and one of the pairs of anchoring lugs 43. This anchoring connection operates to hold the wrench 2 against movement and thus prevent turning movement of the drill pipe 12 when the wrench 3 is subsequently operated by the motor 4 to rotate the drill pipe 11. The handle 41 of the other wrench 3 is then connected by pivot pin 47 to the lower end of the piston rod 26. After these connections are made, the motor 4 is operated to move the piston rod 26 downwardly to rotate the wrench 3 and drill pipe 11 in a counterclockwise direction as viewed in FIGURE 3 relative to the drill pipe 12 and to thus tighten or loosen the threaded connection or joint 13 therebetween.

Attention is particularly directed to the fact that the laterally spaced recesses 10 in the saddle brackets 7, 8 and 9 provide for relative rotation of the parts connected by a threaded joint 13 in opposite directions and thus to either tighten or loosen the joint. Reverse relative rotation of the parts 11 and 12, for example, can be effected readily by reversing the positions of the wrenches 2 and 3 on such parts and then moving the work to a position supported in the saddle bracket recesses 10 at the left of the apparatus as viewed in FIGURE 3. The handle 41 of the wrench 3 is then connected with the motor 4 as described above, and the handle of the wrench 2 is anchored to the other pair of anchoring lugs 43 on the column 21 at the left of FIGURE 3. Reversal of the wrench connections in this manner operates to render subsequent operation of the motor 4 effective to rotate the wrench 3 and pipe section 11 in a reverse or clockwise direction as viewed in FIGURE 3.

As a safety measure, the space around the motor operating and anchoring connections for the wrenches 2 and 3 is enclosed by protective panels 48 of expanded metal. One of the panels 48 at the right of the frame 20 as viewed in FIGURES 1 and 2 forms a door and has a hinge 49 connecting it for movement between open and closed positions to provide for endwise movement of the wrenches to a position underneath the motor 4 and to provide access for making the necessary operating connections with the wrench handles 41. Opening and closing movement of the door panel 48 is counter-balanced by a cable 50 that is trained over guide pulleys 51 and has a connection 52 at one end with the lower end of the hinged door panel 48 and a counter-balance weight 53 attached to its other end.

From the foregoing, it will be apparent that the apparatus of this invention provides for both making and breaking threaded connections. Attention is particularly directed to the fact that this is accomplished by a cradle support for the work that is provided with an anchor for holding one of the joint parts and a motor 4 for rotating the other of the joint parts, and that this arrangement, more particularly, enables the use of pipe tongs or

4

wrenches 2 and 3 of conventional construction. In addition, it further enables the use of a motor 4 having sufficient capacity to break the largest and tightest joints encountered in drilling operations, the only limitation on the capacity of the motor 4 being the breaking strength of the wrenches 2 and 3. It will also be apparent that the apparatus of this invention is self-contained and may be readily transported as an assembled unit to the site of a drilling operation.

While one embodiment of my invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. In an apparatus for making and breaking a threaded joint between an assembly of two parts, the combination comprising a first frame including laterally spaced horizontal side beams and a plurality of saddle brackets extending transversely of said side beams at points spaced longitudinally of said frame, said saddle brackets providing a support for said assembly, a second frame projecting upwardly from said side beams, a pair of wrenches respectively engaged with said parts on opposite sides of said joint, each of said wrenches having an operating handle projecting outwardly from the part engaged thereby, means anchoring one of said handles and the wrench operated thereby to one of said frames to hold one of the said parts of said assembly against rotation on said saddle brackets, means for rotating the other of said assembly parts comprising a fluid pressure motor having a pivotal connection at one end with said second frame and a pivotal connection at its other end with the other of said handles, said motor being effective upon operation to rotate said other wrench and thereby rotate said parts relative to each other, and means rendering said motor effective to rotate said assembly parts in opposite directions comprising means on said saddle brackets for selectively supporting said assembly in either of two laterally spaced positions.

2. An apparatus as defined in claim 1 characterized by said motor being suspended from said second frame in a vertical position arranged centrally with respect to the said two positions in which said assembly is selectively supported on said saddle brackets.

3. In an apparatus for making and breaking a threaded joint between two parts connected thereby, the combination comprising a frame for selectively supporting an assembly of said parts and joint in either of a pair of laterally spaced positions in which the axis of said joint extends horizontally, a fluid pressure motor suspended in a vertical position arranged above and centrally with respect to the said two positions in which said assembly is supported on said frame, a pair of wrenches respectively engaged with said parts on opposite sides of said joint, means anchoring one of said wrenches and the part engaged thereby against rotation on said frame, and means connecting the other of said wrenches with said motor to render it effective to rotate said other wrench and thereby said parts relative to each other, said motor being effective to selectively rotate said parts in opposite directions upon selective movement of said assembly from one to the other of its supported positions on said frame and reversal of the engagement of said wrenches with said parts, said anchoring means comprising a pair of laterally spaced anchors, and means for selectively connecting said one wrench with one of said anchors according to the direction in which said parts are to be rotated relative to each other.

4. In an apparatus for making and breaking a threaded joint between an assembly of two parts, the combination comprising a first frame including laterally spaced horizontal side beams and a plurality of saddle brackets extending transversely of said side beams at points spaced longitudinally of said frame, means on said saddle brackets for selectively supporting said assembly in either

5

of two laterally spaced positions in which the axis of said threaded joint extends horizontally, a second frame including vertical supporting members projecting upwardly respectively from said side beams and a horizontal supporting member extending transversely between the upper ends of said vertical members, a pair of wrenches respectively engaged with said parts on opposite sides of said joint, each of said wrenches having an operating handle projecting outwardly from the part engaged thereby, anchoring lugs on each of said vertical members at points spaced above said side beams, means for selectively anchoring one of said wrench handles to one of said anchoring lugs to hold one of the said assembly parts of said assembly against rotation on said saddle brackets, and means for rotating the other of said assembly parts comprising a fluid pressure motor, means including a pivotal connection for suspending one end of said motor from said horizontal supporting member in a vertical position arranged centrally with respect to the said two laterally spaced selective positions of said assembly, and means connecting the other end of said motor with the other of said wrench handles to thereby render said motor effective upon operation to rotate said other wrench and thereby said assembly parts relative

6

to each other, the said means for supporting said assembly in laterally spaced positions on said saddle brackets together with said wrenches and the means for selectively anchoring said other wrench to said anchoring lugs co-operating to render said apparatus selectively operable to rotate said threaded joint in opposite rotational directions.

References Cited by the Examiner

UNITED STATES PATENTS

10	874,275	12/1907	Winger	81—54
	1,522,408	1/1925	Bayard	29—240
	1,736,009	11/1929	Nixon.	
	1,806,481	5/1931	Martois	81—27
15	1,907,461	5/1935	Sunde	29—240 X
	2,293,107	8/1942	Branham	81—57 X
	2,627,772	2/1953	Wharton	81—57
	2,871,743	2/1959	Kelley	81—53
	3,035,336	5/1962	McConnell	29—240
20	3,174,217	3/1965	Sheppard et al.	29—240

WILLIAM FELDMAN, *Primary Examiner.*M. S. MEHR, J. L. JONES, JR., *Assistant Examiners.*