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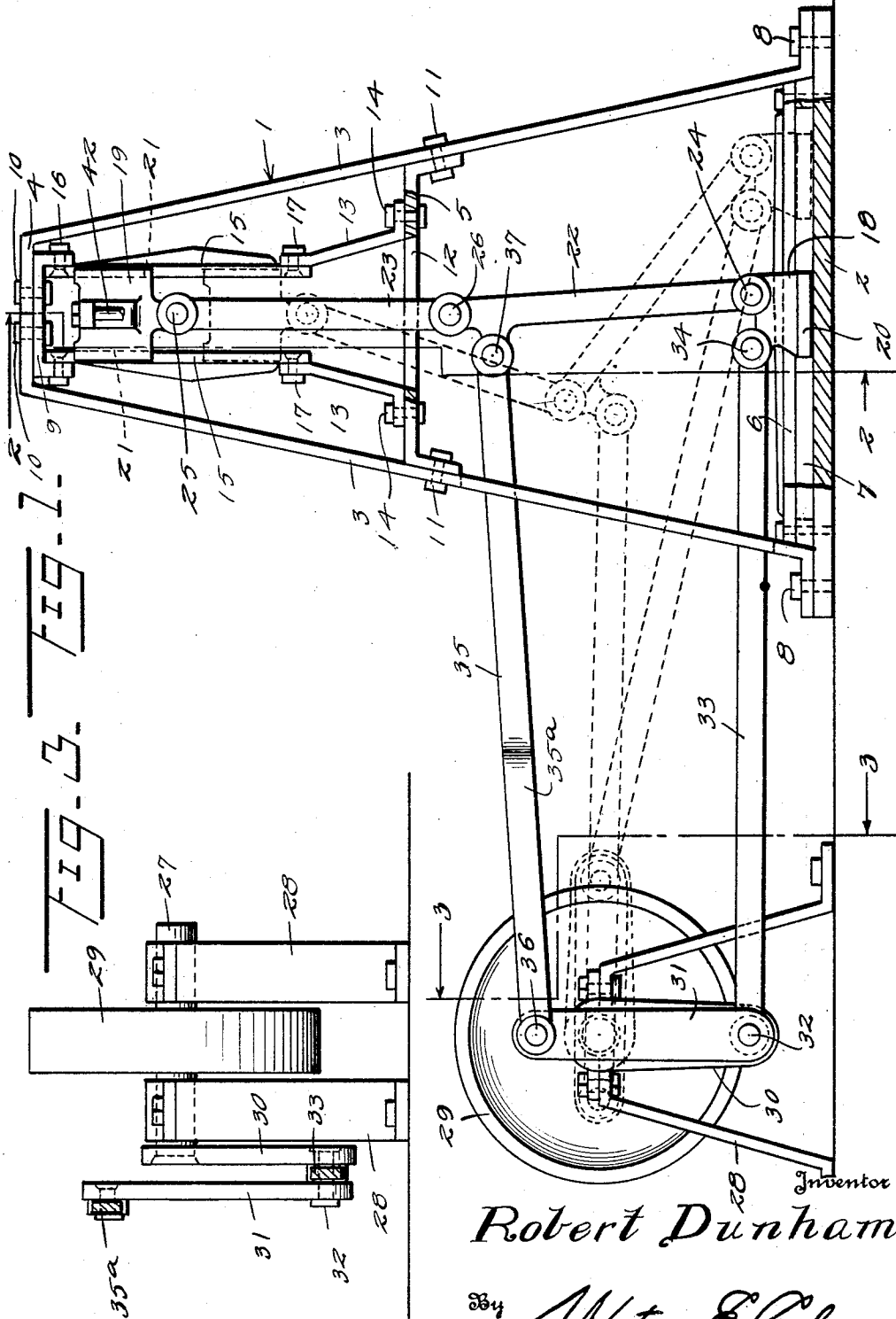
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POWER JACK

Filed Feb. 14, 1931

2 Sheets-Sheet 1



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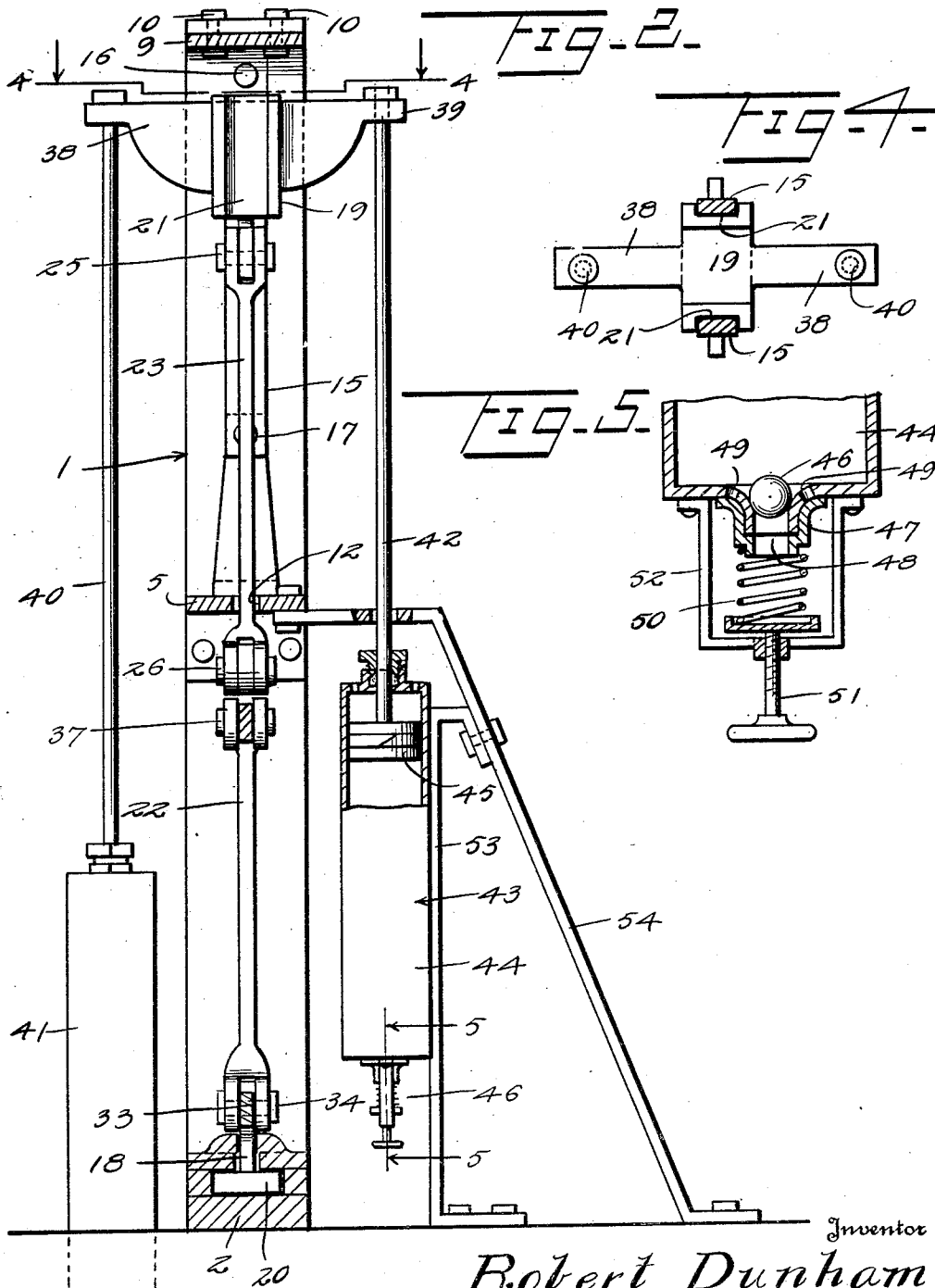
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POWER JACK

Application filed February 14, 1931. Serial No. 515,867.

This invention relates to power jacks for oil well and other pumps, and has for one of its objects to provide a novel, simple and highly efficient device of this character which shall be adapted, during each revolution of its power shaft and without the aid of gears, to impart two strokes to the piston of a pump.

To attain the foregoing and other objects, the invention comprehends the provision of a power jack which shall embody a power shaft, a vertically movable cross head connected to the piston of the pump, a horizontally movable cross head connected to said first cross head by toggle links, and means connecting the horizontally movable cross head and the toggle links to the power shaft for operation in opposite directions by the power shaft during each half revolution thereof.

The invention further comprehends the provision of a power jack of the character stated wherein the means connecting the horizontal cross head of the toggle links to the power shaft shall embody crank arms of different lengths fixed to and extending in opposite directions beyond the power shaft, a link connected to the longer crank arm and to the horizontally movable cross head, and a link connected to the shorter crank arm and to the toggle links.

The invention is hereinafter fully described and claimed, and illustrated in the accompanying drawings, wherein:—

Figure 1 is a view partly in side elevation and partly in vertical section of a power jack constructed in accordance with my invention.

Figure 2 is a sectional view on an enlarged scale taken on the vertical planes indicated by the line 2—2 of Figure 1.

Figure 3 is a sectional view on a reduced scale taken on the vertical planes indicated by the line 3—3 of Figure 1.

Figure 4 is a sectional view taken on the horizontal planes indicated by the line 4—4 of Figure 2, and

Figure 5 is a sectional view on an enlarged scale taken on the vertical plane indicated by the line 5—5 of Figure 2.

The power jack comprises a standard 1 which is in the form of an open frame and

comprises a base member 2, side members 3, a top member 4 and an intermediate cross member 5. The base 2 is of elongated rectangular formation in plan, and is provided in its upper side with a recess 6 extending longitudinally thereof and having its side walls provided with longitudinally extending grooves 7. The side members 3 incline upwardly from the ends of the base member 2 and in the direction of each other, and have their lower ends secured, as at 8, to the base member. The top member 4 is formed integrally with the side members 3, and a bracket 9 is secured by elements 10 to the lower side of the top member.

The cross member 5 is located in a plane approximately situated centrally between the base member 2 and top member 4, and is secured, as at 11, to the side members 3. The cross member 5 is provided with a longitudinal slot 12 extending in the general direction of the extension of the recess 6 of the base member 2. Bracket arms 13 incline upwardly from the cross member 5 and in the direction of each other, and have their lower ends secured, as at 14, to the cross member at the ends of the slot 12 in said member. Vertically disposed guides 15 are secured at their upper ends, as at 16, to the bracket 9, and are secured at their lower ends, as at 17, to the bracket arms 13. The guides 15 are located at opposite sides of and spaced equally from a vertical plane coincident with the transverse center of the base member 2.

A horizontally movable cross head 18 is mounted in the recess 6 of the base member 2, and a vertically movable cross head 19 is mounted in the guides 15. The cross head 18 is provided with ribs 20 which fit in the grooves 7 of the recess 6 to retain it against upward displacement, and the cross head 19 is provided with vertical grooves 21 which receive the guides 15 to retain it against lateral displacement. The cross heads 18 and 19 are connected by links 22 and 23. The link 22 is pivotally connected at its lower end, as at 24, to the cross head 18, the link 23 is pivotally connected, as at 25, to the cross head 19, and the links are pivotally connected

together, as at 26. The link 23 extends through the slot 12 in the cross member 5.

A power shaft 27 is journaled in bearing standards 28 located in spaced relation to the standard 1. The power shaft 27 has fixed thereto a pulley 29 which in practice is belted to a prime mover. If desired, the connection between the power shaft 27 and the prime mover may be established through the medium of a connecting rod and crank, as will be well understood. The power shaft 27 is arranged at right angles to the paths of movement of the cross head 18 and the toggle links 22 and 23. A crank arm 30 is secured at one end to one end of the power shaft 27, and a crank arm 31 is fixedly secured at one end by a pin 32 to the power transmitting end of the crank arm 30, the pin being fixedly secured to the crank arm 30. The crank arm 31 is arranged in spaced parallel relation to the crank arm 30, and extends from the pin 32 in the direction of and beyond the power shaft 27.

A link 33 is connected at one end to the pin 32, and is connected at its other end, as at 34, to the cross head 18. A link 35 is connected at one end, as at 36, to that end of the crank arm 31 remote from the pin 32, and is connected at its other end, as at 37, to the toggle link 22 at a point close to the connection between this toggle link and the toggle link 23. The link 33 is connected to the pin 32 between the crank arms 30 and 31, and the link 35 is connected to the outer side of the crank arm 31, the link 35 being provided with a laterally offset portion 35a to permit it and the crank arm 31 to pass each other.

The effective length of the crank arm 30 is greater than the corresponding length of the crank arm 31, and such arm lengths extend in diametrically opposite directions beyond the power shaft 27, with the result that, during each phase or half rotation of the power shaft 27, the connecting link 33 is moved to and fro in one direction and the connecting link 35 is moved to and fro in the opposite direction, to effect the reciprocation of the cross head 18 and the rocking of the toggle links 22 and 23 in opposite directions. During one phase of each revolution of the power shaft 27, the cross head 18 is moved in one direction from and returned to a position in substantial alinement with the cross head 19, and during the other phase of each revolution of the power shaft, the cross head 18 is moved in the opposite direction from and returned to said position. During one phase of each revolution of the power shaft 27, the toggle links 22 and 23 are moved in one direction from and returned to a position in substantial alinement with the cross heads 18 and 19, and during the other phase of each revolution of the power shaft the toggle links are moved in the opposite direction from and returned to such position, the

toggle links moving in one direction while the cross head is moving in the opposite direction. It will thus be seen that the cross head 19 is moved upwardly and downwardly during each phase of each revolution of the power shaft 27.

The cross head 19 is provided with arms 38 and 39 which extend in opposite directions therefrom. The cross head arm 38 has secured thereto the sucker rod 40 of a well pump 41, and the cross head arm 39 is secured thereto to the piston rod 42 of a dash pot 43. The dash pot 43 comprises a vertical cylinder 44, a piston 45 reciprocating in the cylinder and connected to the rod 42, and valves 46 and 47 at the lower end of the cylinder. The cylinder 44 is provided with an air inlet port 48 which is controlled by the downwardly seating valve 46, and is provided with air outlet ports 49 which are controlled by the upwardly seating valve 47, the area of the air inlet port 48 being greater than the combined areas of the air outlet ports 49. The valve 46 is seated by gravity and the valve 47 is seated by a spring 50, the tension of the spring being variable through the medium of a screw 51 carried by a bracket 52 secured to the cylinder 44. The cylinder 44 is secured to an upright bar 55 which is located at one side of the standard 1 and supported by a brace 54 which also assists in maintaining the standard in upright position.

While the specific construction of the valves 46 and 47 are shown and described, it is to be understood that the valves may be of any other well-known or appropriate construction. The sucker rod 40 of the pump 41, and the piston 45 of the dash pot 43 move upwardly and also downwardly simultaneously. As the area of the air inlet port 48 is greater than the combined area of the air outlet ports 49, the piston 45 may move up freely and a resistance is offered to its downward movement, to the end that the dash pot 43 may function as a counterbalance for the sucker rod 40 during the down stroke of the latter.

From the foregoing description taken in connection with the accompanying drawings, it will be understood that the downward movement of the cross head 19 will impart a corresponding movement to the sucker rod 40 of the well pump 41, that the upward movement of this cross head will impart a corresponding movement to the sucker rod, and that as this cross head is moved downwardly and then upwardly during each phase or half revolution of the power shaft 27 two strokes will be imparted to the sucker rod for each revolution of the power shaft.

While I have described the principle of the invention, together with the structure which I now consider the preferred embodiment thereof, it is to be understood that the struc-

ture shown is merely illustrative and that such changes may be made, when desired, as fall within the scope of the invention as claimed.

5 What is claimed is:—

1. A power jack comprising vertically and horizontally movable cross heads, toggle links connecting the cross heads, a power shaft, and links connected to the power shaft at
10 different distances therefrom and connected respectively to the horizontally movable cross head and to the toggle links.

2. A power jack comprising vertically and horizontally movable cross heads, toggle
15 links connecting the cross heads, a power shaft, a crank arm connected to the power shaft, a second crank arm connected to the power shaft and having an effective length greater than said first crank arm, a link con-
20 nected to said first crank arm and to the toggle links, and a link connected to said second crank arm and to the horizontally movable cross head.

3. A power jack comprising vertically and
25 horizontally movable cross heads, toggle links connecting the cross heads, a power shaft, a crank arm connected to the power shaft, a second crank arm connected to the power shaft and having an effective length greater
30 than said first crank arm, the effective lengths of the crank arms extending in diametrically opposite directions from the power shaft, a link connected to said crank arm and the toggle links, and a link connected to said sec-
35 ond crank arm and the cross head.

4. A power jack comprising cross heads movable in angularly related planes, toggle links connecting the cross heads, a power shaft, and means connecting the power shaft
40 to one of said cross heads and to the toggle links and adapted during the rotation of the power shaft to reciprocate such cross head and to rock the toggle links simultaneously in opposite directions.

5. A power jack comprising cross heads
45 movable in angularly related planes, toggle links connecting the cross heads, a power shaft, and means connecting the power shaft to one of said cross heads and to the toggle links and adapted during each half rotation
50 of the power shaft to rock such cross head to and fro from a substantial aligned position with the other cross head and to rock the toggle links to and fro from a substantial aligned position with the cross heads, such
55 cross head and toggle links moving in opposite directions.

6. A power jack comprising a standard embodying base, top and cross members, a
60 cross head slidably mounted on the base, vertical guides secured to and between the top and cross members, a cross head slidably supported with the guides, toggle links connecting the cross heads, a power shaft, a
65 crank arm secured to the power shaft, a sec-

ond crank arm secured to the power shaft and having an effective length greater than that of said first crank arm, the effective lengths of the crank arms extending in op-
posite directions from the power shaft, a
70 link secured to said first crank arm and said first cross head, and a link secured to said second crank arm and to the toggle links.

7. A power jack for a pump comprising cross heads movable in angularly related
75 planes, means adapted to connect one of the cross heads to the sucker rod of the pump, a counter poise for the sucker rod connected to such cross head, toggle links connecting
80 such cross head to the other cross head, a power shaft, and means connecting said other cross head and the toggle links to the power shaft and adapted during each revolution of the power shaft to impart two strokes to the
85 sucker rod.

In testimony whereof I hereunto affix my signature.

ROBERT DUNHAM.

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