Dec. 20, 1932. F. B. McCROSKY 1,891,552

QUICK RETURN STRAIGHT LINE PUMP JACK

Filed Dec. 18, 1931

Fig. 1

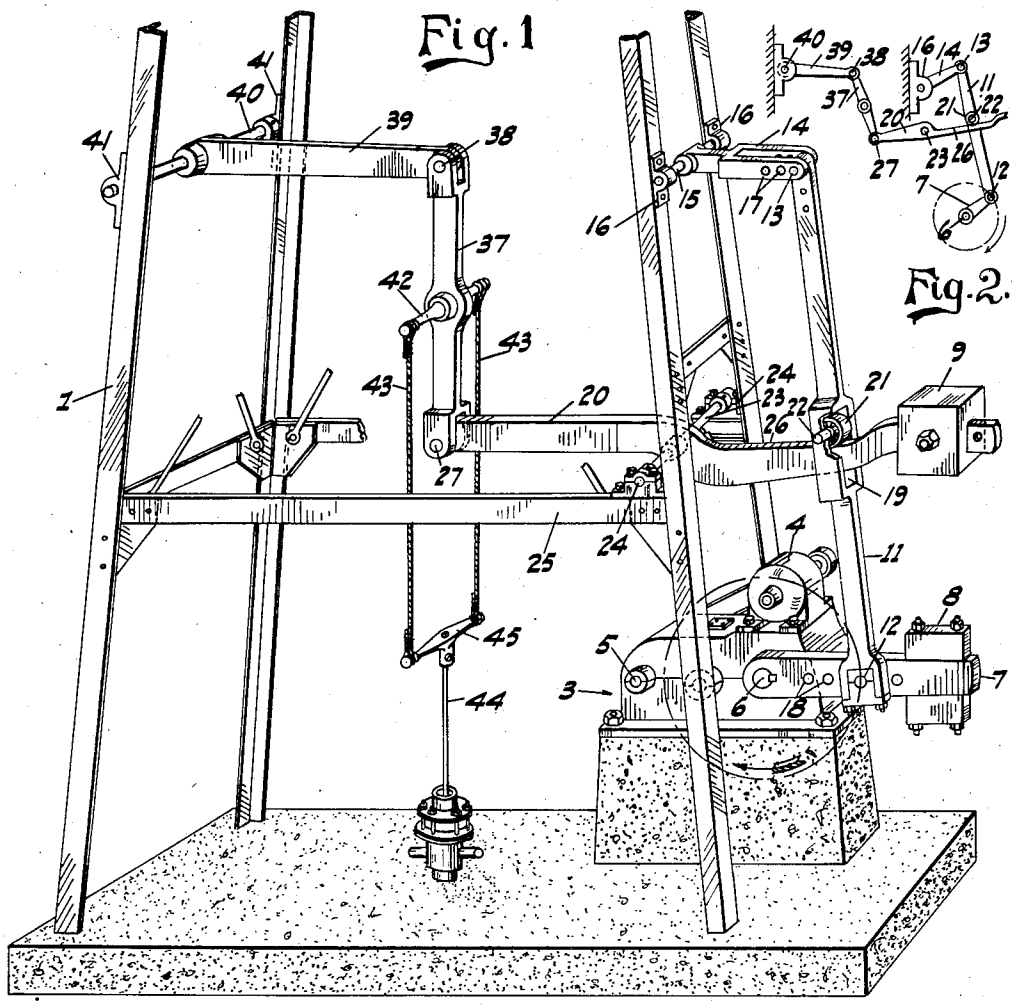


Fig. 2.

Fig. 6

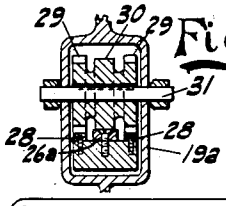


Fig. 4

Fig. 3

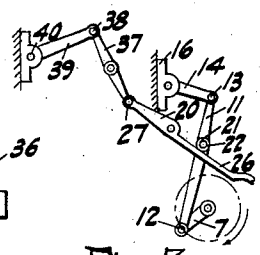
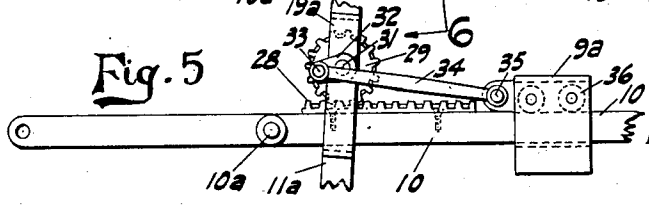


Fig. 5



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UNITED STATES PATENT OFFICE

FRED B. McCROSKY, OF WALNUT PARK, CALIFORNIA

QUICK RETURN STRAIGHT LINE PUMP JACK

Application filed December 18, 1931. Serial No. 581,826.

My invention relates to improvements in pump jacks.

An important object of my invention is to provide an improved pump jack, the paramount feature of which includes a straight line pumping stroke and a quick return motion of the pumping parts at the end of the stroke.

In addition to the foregoing object I desire to point out other salient features which are incorporated in my invention which are new and novel, and are well adapted for use in the oil pumping industry. These features include a trapeze sling for the polish rod, which eliminates the heavy mule-head, thus providing for less wear on cables, greater freedom of polish rod, greater ease to swing cables in and out of play, together with means to adjust the walking beam to permit of ample space whereby to withdraw the rods from the well.

Another novel feature is the provision of improved supporting, balancing and counterbalancing means of the walking beam and its cooperating parts.

Still other objects, advantages and features of invention will hereinafter appear.

In the drawing accompanying I have shown what constitutes, in general, a preferred embodiment of my invention, which may, however, be used in still other branches of mechanics than that in connection with which it is disclosed, and I do not wish to be limited to the forms embodied, since permissible changes may be resorted to without departing from the scope of the invention as hereinafter claimed, and such changes and modifications are included within its scope.

With reference to the drawing:

Fig. 1 is a perspective view of a pumping unit containing an embodiment of my invention.

Figs. 2 and 3 are diagrams which display relative relation of parts near the beginning and ending of the pumping stroke whereby to depict the quick return action of the pump.

Figs. 4 and 5 show a modification and also display respectively the relative positions of the walking beam counter-weight at the limited swing of the pitman.

Fig. 6 is a section taken on the line 6—6 of Fig. 4.

In the drawing the derrick 1 is supported by a derrick floor 2. Mounted on said floor 2 is a double reduction speed reducer pumping unit 3 of any standard or preferred design, it comprising an electric motor 4, which may be either directly connected through a flexible coupling to the high speed shaft of the reducer, or it may be driven from the high speed shaft 5 through a "Tex-rope" or similar means as shown. The latter hook-up is preferred on account of easy speed variation. The slow speed shaft 6 of the reducer serves as the band-wheel shaft and to it is keyed the crank 7. The pumping unit 3 is a self contained pumping unit having all gears enclosed and running in a bath of oil. The crank has four different lengths of stroke which permits the operator to adjust the capacity of the machine to that of the well without changing the number of strokes per minute, and there is further provided means for finer adjustment as will hereinafter be pointed out. This feature is particularly desirable when there is a direct connection of the motor and machine.

Beyond the wrist pin holes of the crank is secured a weight 8, said weight being adapted for cooperation with a like balance 9 in combination with the walking beam 10 or with the weight 9a of Figs. 4 and 5.

To the crank 7 is fastened one end of the pitman 11 by means of a wrist pin 12, the other end of said pitman being fastened to a pin 13 pivotally swung in a link 14 oscillative with respect to a shaft 15 journaled in bearings 16 fastened to the derrick frame 1. The link 14 is provided with a plurality of holes 17, which taken in conjunction with the holes 18 in the crank, provide for minute adjustment for regulating the pumping stroke.

Centrally of the pitman is a boxed-in aperture 19 through which the walking beam 20 projects and within which is mounted the roller bearing wheel 21 by means of the pin 22. The walking beam 20 is tiltingly mounted upon a shaft 23 at substantially its mid-length. Said shaft is journalled in pillow blocks 24 which are supported by the derrick

proper or by a Samson post of standard construction. These blocks may be made adjustable on the members 25 which support them by means of slots or otherwise, so that the beam 20 may slide out of the path of the rods as they are withdrawn from the well when the framing members of the derrick permit. In the drawing, however, they are shown conveniently near their limiting position.

The walking beam 20 is provided with a recessed face 26 that forms a track upon which the wheel 21 plays on the pumping and return stroke said track being substantially in line with the axis upon which the walking beam is tiltingly mounted. The approximate beginning and ending of the stroke is diagrammatically shown in Figs. 2 and 3. The depressed character of the track 26 safeguards the walking beam against edge-wise displacement at its pivot under the heavy working strain required. From Figs. 4, 5 and 6 it will be seen how I vary the effect of the weight on the quick return stroke while the pumping rods are being lowered.

Referring to the modification shown in Figs. 4 and 5 and 6, on the beam 10 I fasten racks 28 and movable on said racks are the pinions 29 mounted on the shaft 31 journalled in the boxed-in aperture 19, there being a bearing roller 30 interposed between the two pinions yet integral therewith, said roller resting upon the walking beam track rail 26*a* secured to the upper side of the walking beam.

The head of the beam 20 is fastened by a pin 27 to a link 37, and said link is pivotally swung from a pin 38 in a fulcrum link 29 oscillative upon the shaft 40 journalled in bearings 41 fastened to the derrick frame.

The distance between the pivot pins of the link 39 is the same as the distance between pin 27 and axis of the shaft 23, and the suspension bar 42 to which the trapeze cables 43 are fastened, is placed at the mid-length of the link 37. Hence the polish rod 44, fastened at the mid-length of the spreader bar 45, will be elevated and lowered in a straight line as the crank 7 rotates to reciprocate the wheel 21 on the surface of the beam 20. The same equalization will result with the modification shown in Figs. 4 and 5.

A turnbuckle (not shown) could be provided on one of the cable lines 43 to assure the operator of equal tension on other lines while pumping.

Referring to the modification shown in Figs. 4 to 6, the walking beam 10, pivotally supported at 10*a*, is provided with a double rack 28 which forms a track whereon the double cog wheel 29 travels. Said track has a central tread portion 26*a* upon which bears a roller portion 30 which is located between and preferably formed integral with the two edges of the cog wheel 29.

Said double cog wheel 29 is housed within a box or yoke 19*a* with which the pitman 11*a* is provided at a point intermediate its pivotal mountings which are not shown in Figs. 4 and 5, but which it is to be understood are the same as illustrated in Fig. 1. The walking beam 10 has a weight 9*a* mounted thereon and movable lengthwise thereof. This weight is shown supported by anti-friction rollers 36 which travel along the upper edge of the walking beam. Said weight 9*a* has pivotally connected therewith at 35 a connecting rod 34 which, in turn, is pivotally connected at 33 to a crank 32 that is fixed to a shaft 31 which is splined to the cog wheel member 29. The connection thus formed between the cog wheel 29 and weight 9*a* causes the position of said weight to be automatically adjusted during the operation of the walking beam in such a manner as to vary the counter-balancing effect of said weight so that it will produce the desired counter-balancing effect during all positions of the walking beam.

In Fig. 2 is diagrammatically shown the position of the parts at the beginning of the pumping stroke. The counter-balancing weights are not shown in this view, but it will be readily seen that as the crank 7 proceeds to move in the clock-wise direction its weight 8 (Fig. 1) will most effectively aid the pumping stroke produced while at the same time the weight 9 (Fig. 1) will, providing the modification shown in Figs. 4 and 5 be used, be in the extended position where it will effectively supplement the power required for the pumping stroke. In Fig. 3 the parts are in the position they assume at the beginning of the down stroke where power is not required but additional speed is desired. In this position of the parts the weight 9*a* will be retracted to the position shown in Fig. 5 where it will exert minimum opposition to the upward movement of the outer end of the walking beam 10.

I claim:

1. In a quick return stroke construction for pumps, a driving shaft, a crank fixed to said shaft, a pitman having one of its ends operatively connected with said crank to be reciprocated thereby, a link adjustably and pivotally connected with the other end of said pitman, a support whereon said link is pivotally mounted, a polish rod, a walking beam pivotally supported between its ends, its inner end being connected with said polish rod, and having its outer end portion extending transversely and loosely through said pitman, said pitman having a shifting engagement with the outer portion of said walking beam to regulate the upstroke of the pump, said shifting engagement being nearest to the pivotal support of said walking beam during the down stroke of the pump to permit an accelerated down stroke, and means

adapted to operatively connect the inner end of said walking beam with said polish rod.

2. In a quick return stroke construction for pumps, a driving shaft, a crank fixed to said shaft, a pitman having one of its ends operatively connected with said crank to be reciprocated thereby, a link adjustably and pivotally connected with the other end of said pitman, a support whereon said link is pivotally mounted, a polish rod, a walking beam pivotally supported between its ends, its inner end being connected with said polish rod, and having its outer end portion extending transversely and loosely through said pitman, said pitman having a shifting engagement with the outer portion of said walking beam to regulate the upstroke of the pump, said shifting engagement being nearest to the pivotal support of said walking beam during the down stroke of the pump to permit an accelerated down stroke, and means adapted to operatively connect the inner end of said walking beam with said polish rod, said walking beam having a depressed track along its upper side, said pitman having anti-friction means adapted to travel along said track.

3. In a quick return stroke construction for pumps, a walking beam having an upwardly directed face with a recessed portion, said recessed portion forming a track, a pitman to operate said walking beam, and an anti-friction roller carried by said pitman and positioned to engage said track to depress the portion of said walking beam whereon said track is formed.

4. In a quick return stroke construction for pumps, in combination, a walking beam, an upright pitman having a transverse aperture extending through it between its ends, and an anti-friction roller mounted upon said pitman within said aperture and positioned to engage, travel along and depress a portion of said walking beam which extends through said aperture.

5. In a quick return stroke construction for pumps, in combination, a walking beam provided with an upwardly facing rack which extends therealong, a pitman, a pivotal connection for one end of said pitman, a crank arm to which the other end of said pitman is pivotally connected, a cog wheel carried by said pitman intermediate its ends, said wheel being constructed and arranged to engage and travel along said rack to operate said walking beam during the upstroke of the pump, a weight mounted upon said walking beam and movable lengthwise thereof, and means eccentrically connecting said wheel with said weight to adjust the position of said weight in order to vary automatically the counter-balancing effect of said weight during the operation of said walking beam.

6. In a quick return stroke construction for pumps, in combination, a walking beam provided with an upwardly facing double rack which extends therealong, a pitman, a pivotal connection for one end of said pitman, a crank arm to which the other end of said pitman is pivotally connected, a double cog wheel carried by said pitman intermediate its ends to travel along said double rack, said walking beam having a tread portion between the two parts of said rack and said cog wheel having a central roller portion to engage said tread portion to bear upon said walking beam during the up-stroke of the pump, and means eccentrically connecting said wheel with said weight to change the position thereof to vary automatically its counter-balancing effect.

7. In a quick return stroke construction for pumps, in combination, a walking beam provided with an upwardly facing rack which extends therealong, a pitman, a pivotal connection for one end of said pitman, a crank arm to which the other end of said pitman is pivotally connected, a cog wheel carried by said pitman intermediate its ends, said wheel being constructed and arranged to engage and travel along said rack to operate said walking beam during the up-stroke of the pump, a weight mounted upon said walking beam and movable lengthwise thereof, a crank carried by said wheel, and a connecting rod connecting said crank with said weight in order to vary automatically the counter-balancing effect of said weight during the operation of said walking beam.

8. In a device of the character described, a frame, a walking beam pivotally supported thereon, a fulcrum link having one end pivotally fastened to said frame, a pendant link having its upper end pivoted to the free end of said fulcrum link, the lower end of said pendant link being pivoted to said walking beam, a polish rod, and means connected with said pendant link at substantially its mid-length whereby said polish rod is suspended therefrom.

9. In a device of the character described, a frame, a walking beam pivotally supported thereon, a fulcrum link having one end pivotally fastened to said frame, a pendant link having its upper end pivoted to the free end of said fulcrum link, the lower end of said pendant link being pivoted to said walking beam, a polish rod, and a trapeze connected with said pendant link at substantially its mid-length whereby said polish rod is suspended therefrom.

FRED B. McCROSKY.