Jan. 17, 1939. C. W. HALL 2,144,149

PUMP OPERATING MECHANISM

Filed Oct. 1, 1937 2 Sheets-Sheet 1

Fig. 1.

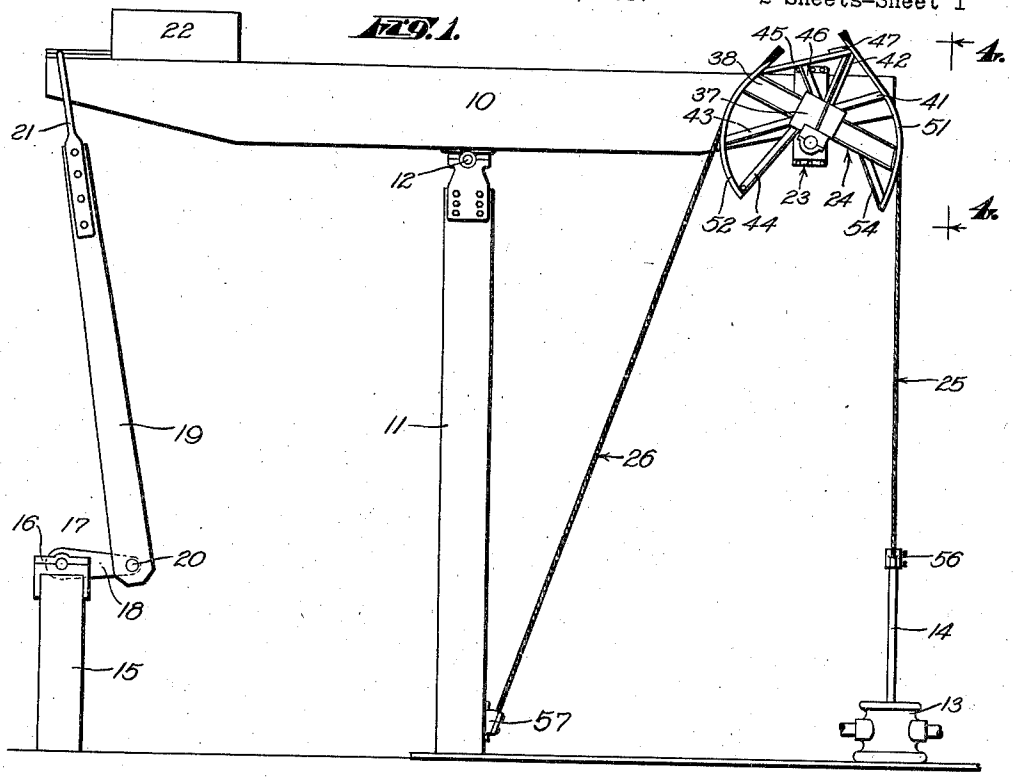


Fig. 4.

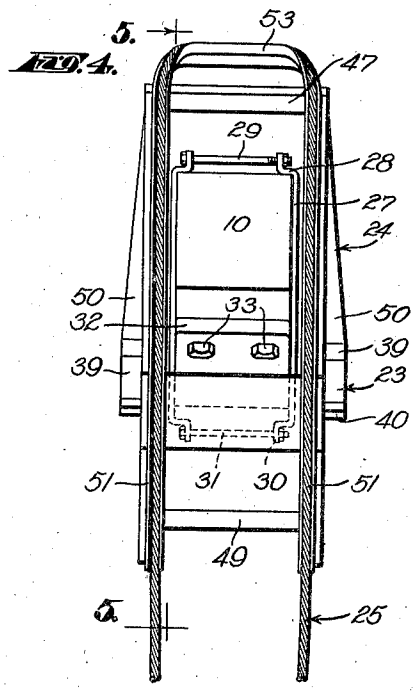


Fig. 2.

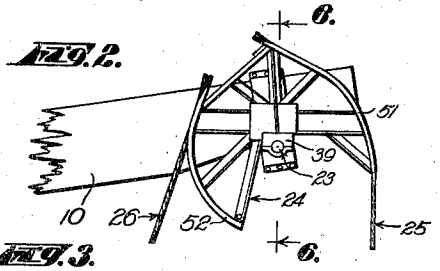
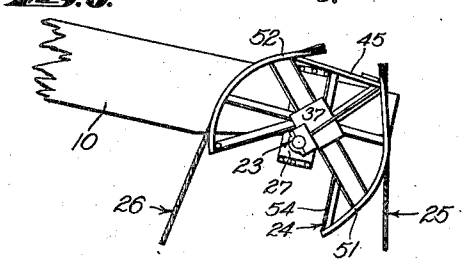


Fig. 3.



Inventor
CHARLES W. HALL
By
His Attorney

Jan. 17, 1939. C. W. HALL 2,144,149

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Filed Oct. 1, 1937 2 Sheets-Sheet 2

FIG. 5.

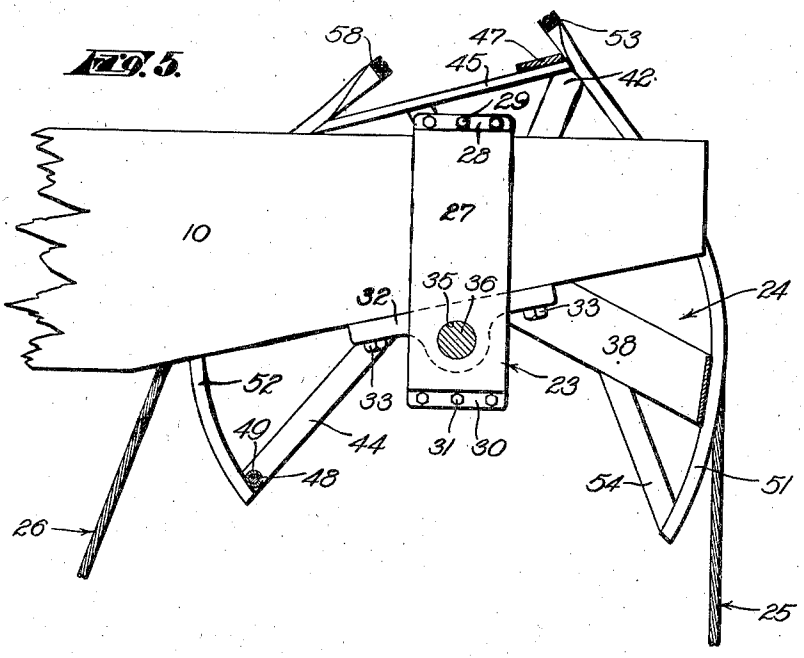


FIG. 6.

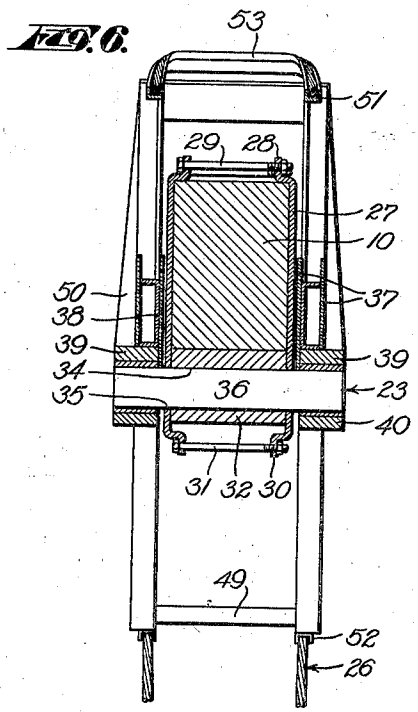
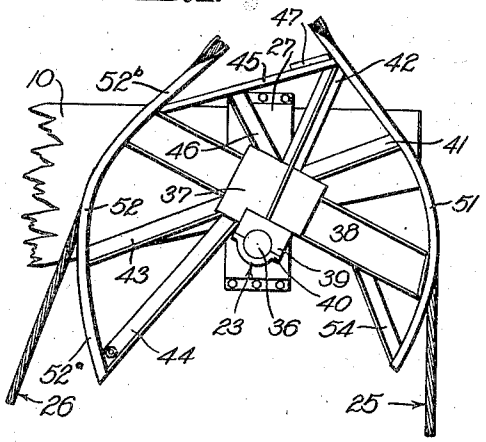


FIG. 7.



Inventor
CHARLES W. HALL
By
His Attorney

Patented Jan. 17, 1939 2,144,149

UNITED STATES PATENT OFFICE

2,144,149

PUMP OPERATING MECHANISM

Charles W. Hall, Long Beach, Calif.

Application October 1, 1937, Serial No. 166,788

17 Claims. (Cl. 74—103)

This invention relates to pumping equipment and relates more particularly to a mechanism for operating a deep well pump. A general object of this invention is to provide a practical and particularly effective pump jack or pump operating mechanism.

Deep well pumps such as oil well pumps are usually operated by a walking beam. The polished rod at the upper end of the pump rod string is connected with one end of the walking beam and a crank mechanism is connected with the other end of the beam to effect its oscillation. The crank mechanism usually includes a crank driven by a suitable power means and a long link or pitman pivotally connected with the crank and the beam to transmit movement from the crank to the beam. The crank and pitman drive does not impart a uniform oscillatory movement to the beam but moves the beam in such a manner that the pump rod is operated at different speeds during different phases of its stroke usually moving the rod at increased speed as it approaches the ends of its stroke. This non-harmonic stroke or non-uniform movement of the pump rod places severe strains on the pumping equipment and often causes whipping and failure of the pump rod. Where a long stroke pump is employed it is necessary to operate the walking beam with a long crank and the condition just mentioned is thus aggravated.

An important object of the present invention is to provide a pump jack or pump operating mechanism of the walking beam type that corrects or compensates for irregularities of movement of the beam due to the crank action, thereby producing a harmonic motion or a nearly uniform motion of the pump rod to reduce the strains on the pumping equipment and permitting an increase in the speed of the pump rod.

Another object of this invention is to provide a pump operating mechanism of the character mentioned that may be constructed or regulated to produce any desired or special movement of the pump rod where operating conditions warrant or necessitate such movement to increase the efficiency of the pump.

Another important object of this invention is to provide a pump jack or well pump operating mechanism of the walking beam type by means of which the pump rod is given a longer stroke and a more rapid movement for a given movement of the walking beam whereby less power is required to operate the pump at a selected or preferred rate. The mechanism of the present invention includes means for increasing or multiplying the extent of movement of the pump rod over that of the walking beam during each movement of the beam whereby the beam may be given a shorter, slower stroke than previously and yet effect a reciprocation of the pump rod at the desired speed and through a stroke of the desired length. This increase in the rate and length of movement of the pump rod is accompanied by correction of the irregularities of movement of the beam whereby the rod may be given a simple or true harmonic motion.

Another object of this invention is to provide an appliance or attachment for the walking beam of a pump jack that corrects or compensates for irregularities in the movement of the beam due to the crank action whereby the pump rod may be given a simple harmonic motion or any selected special movement and that increases the length and rate of movement of the pump rod.

Another object of this invention is to provide an appliance or attachment of the character mentioned that may be applied to any typical or standard walking beam with little or no modification.

Another object of this invention is to provide an appliance or attachment of the character mentioned that is simple and inexpensive to manufacture and install.

A further object of this invention is to provide an appliance or attachment of the character mentioned that stabilizes the walking beam preventing lateral movement of the beam and the resultant wear of the walking beam bearing.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawings, in which:

Figure 1 is a side elevation of the mechanism provided by the present invention illustrating the walking beam and the other parts in intermediate positions. Fig. 2 is a fragmentary view showing the walking beam and the rocker at or approaching the upper end of the stroke of the beam. Fig. 3 is a view similar to Fig. 2 showing the walking beam and the rocker in position at or adjacent the lower end of the stroke of the beam. Fig. 4 is an enlarged end elevation of the beam and the rockers being a view taken as indicated by line 4—4 on Fig. 1. Fig. 5 is a vertical detailed sectional view taken as indicated by line 5—5 on Fig. 4. Fig. 6 is an enlarged vertical detailed sectional view taken as indicated by line 6—6 on Fig. 2 and Fig. 7 is a slightly enlarged fragmentary view similar to Figs. 2 and 3 showing another form of rocker in an intermediate position.

The present invention may be embodied in the form of a complete pump operating mechanism or pump jack of the walking beam type or may be embodied in the form of an attachment or appliance for application to a pump jack of this character. In the following detailed description I will describe the invention embodied in the form of an attachment for a more or less typical

walking beam type well pump operating mechanism. It is to be understood that the invention is not to be construed as limited or restricted to the form or application of the invention about to be described but that it is to be taken as including any features or modifications that may fall within the scope of the claims.

The typical walking beam assembly and well equipment illustrated in the drawings includes a walking beam 10 pivotally supported on a Samson post 11 by a suitable bearing 12. The inner end or active end of the walking beam 12 is substantially directly above the tubing head 13 of the well and the polished rod 14 extends upwardly through the head 13 for connection with the pump operating apparatus. It is to be understood that the polished rod 14 is connected with the pump rod of the well pump (not shown). A jack post 15 is located below the outer end of the beam 10 and is provided at its upper end with a bearing 16. The bearing 16 rotatably supports a driven shaft 17 and a crank 18 is fixed to the shaft 17. A link or pitman 19 operatively connects the outer end of the beam 10 with the crank 18. A pin 20 on the crank 18 pivotally connects the lower end of the pitman 19 with the crank and a stirrup 21 pivotally connects the upper end of the pitman 19 with the rear or outer end of the beam 10. A suitable counterbalance 22 may be carried by the outer end of the walking beam 10 if desired or necessary.

It is to be understood that the device or attachment provided by the present invention is not limited for application to the type of pump jack just described. The device or attachment of this invention is capable of use in connection with pumping mechanisms of various types. For example, it may be employed with a pump actuating mechanism having a single ended oscillating element or beam.

The device or attachment of the present invention includes, generally, a hanger or bearing means 23 on the active or inner end portion of the walking beam 10, rocker wheels or rockers 24 carried by the bearing means 23, a bridle 25 connected with the polished rod 14 and engaged on the rockers 24, and a cable or line 26 connected with a suitable stationary object and engaging over the rockers 24.

The hanger or bearing means 23 is provided to pivotally mount or support the rockers 24 on the walking beam 10. The means 23 may be varied considerably without departing from the broader aspects of the invention. In the particular case illustrated in the drawings the means 23 includes side plates or hanger plates 27 arranged at opposite sides of the beam 10. The plates 27 are spaced a short distance from the inner or active end of the beam 10 and are substantially vertical to bear against the opposite faces of the beam 10. The plates 27 project upwardly from the upper side of the beam 10 and have angular parts or inturned parts 28 that bear downwardly on the upper side of the beam. Tie bolts 29 are arranged through openings in the upper parts 28 of the plates 27 to tie the plates together and clamp them onto the beam 10. In the preferred construction the plates 27 project some distance downwardly beyond the lower side of the beam 10 and have inturned angular parts 30 in their lower ends. Tie bolts 31 are arranged through openings in the parts 30 to connect the lower ends of the plates 27 and to aid in clamping the plates onto the beam 10.

The bearing means 23 further includes a hanger bearing 32 located between the projecting lower portions of the plates 27 at the under side of the beam 10. The base of the bearing 32 may be secured to the under side of the beam 10 by screws or bolts 33 and the opposite ends of the bearing are secured to the plates 27. In practice the bearing 32 may be welded to the projecting lower portions of the plates 27. The bearing 32 has a substantially horizontal opening 34 and the plates 27 are provided with openings 35 registering with the opposite ends of the opening 34. A shaft or trunnion 36 extends through the openings 34 and 35 and projects laterally or outwardly beyond the two spaced plates 27. The trunnion 36 is preferably force-fitted or otherwise fixed in the bearing 32. It is to be particularly noted that the shaft or trunnion 36 of the bearing means 23 being located at the under side of the beam 10 has its axis substantially horizontally aligned with the axis of the beam bearing 10 when the walking beam is in a neutral or horizontal position.

The rockers 24 are important elements of the device serving to move the pump operating bridle 25 in a manner to compensate for irregular movement of the beam 10 and serving to increase the stroke and rate of the movement of the bridle. In the preferred construction there are two like or complementary rockers 24, one rocker being arranged at each side of the walking beam 10. The rockers 24 are supported by the trunnion 36 of the bearing means 23 for oscillatory or pivotal movement when the beam 10 is in operation.

In accordance with the broader aspects of the invention the rockers 24 may be varied considerably in construction. In the particular form of the invention disclosed in the drawings the rockers 24 each include two spaced hub plates 37 and a channel iron 38 passing between the spaced plates 27. The channel irons 38 extend outwardly from the plates 37 to form two spokes of each rocker 24. Bearings 39 are secured to the hub plates 37 and the channel irons 38. In practice one plate 37 of each rocker 24 is welded to the closed side of a channel iron 38 and the other plate 37 is welded to the open side of the channel iron and the bearing 39 is welded to the plates 37 and the adjacent side flange of the channel iron 38. The bearings 39 are preferably of sufficient length to project outwardly beyond the outer plates 37 and the inner ends of the bearings may be welded on the flat faces of the inner plates 37. The bearings 39 are split or provided with removable caps 40 to facilitate the assembly of the rockers 24 on the trunnion 36 and may be provided with suitable bushings or babbitting for cooperating with the projecting end portions of the trunnion 36.

The rockers 24 further include spokes 41 and 42 radiating or extending forwardly from their plates 37 and spokes 43 and 44 radiating rearwardly from the plates 37. The spokes 41, 42, 43 and 44 may be formed of angle iron and their inner ends may be welded to the plates 37 and the channel irons 38. A substantially tangential brace 45 extends between and connects the outer ends of the spoke 42 and the channel iron 38 of each rocker 24. The braces 45 may be welded to the spokes 42 and the channel irons 38. Short spokes 46 may extend outwardly from the hub plates 37 to the braces 45. A cross bar 47 extends between the forward portions of the braces 45 of the two rockers 24. The bar 47 may be welded to the upper sides of the braces 45 and is positioned to normally clear the upper side of

the walking beam 10. The bar 47 may engage against the upper side of the walking beam 10 to limit turning of the rockers 24 and to limit downward movement of the polished rod 14 when the line 26 is being adjusted, replaced or the like. A tie rod 48 passes through openings in the lower portions of the spokes 44 to connect the two wheels 24. The tie rod 48 is suitably connected to the spokes 44 and a spacer 49 may be arranged on the rod between the spokes 44. The projecting bearings 39 may be braced by braces 50 extending longitudinally of the spokes 42 and welded on the outer faces of the bearings and spokes.

Each rocker 24 further includes a track or channel 51 for cooperating with the bridle 25 and a track or channel 52 for cooperating with the line 26. The channels 51 of the rockers 24 are elongate curved members that are U-shaped or channel-shaped in transverse cross section to receive the bridle 25. The channels 51 are longitudinally curved and are secured to the outer ends of the spokes 41 and 42 and the channel irons 38. The channels 51 may be secured to these parts of the rockers by welding. The bridle 25 passes downwardly from the channels 51 to the polished rod 14, and the channels 51 are curved in such a manner that the portions of the bridle extending downwardly from them remain substantially vertical throughout the entire range of movement of the walking beam 10 and the rockers 24. In practice the major intermediate portions of the channels 51 are substantially concentrically curved about the pivotal axis of the rockers 24 and the upper and lower end portions of the channels 51 are relatively straight and tangent to the intermediate portions. This formation of the channels 51 assures the vertical disposition of the depending portions of the bridle 25 and of the polished rod 14 throughout the operation of the mechanism.

In accordance with the invention the channels 51 of the two rockers 24 are connected and formed so that the upper portion of the bridle 25 is looped and trained between the two channels. The channels 51 may be integrally connected by a transverse channel portion 53 that curves upwardly from the channels 51 and then extends transversely above the beam 10. The groove in the channel portion 53 faces upwardly so that the bridle 25 extending through it is held against displacement and yet is free to shift longitudinally. This longitudinal freedom of the bridle 25 in the channel portion 53 serves to maintain both branches of the bridle 25 under substantially uniform tension and this automatic adjusting of the bridle 25 may aid in preventing lateral shifting of the walking beam 10. Braces 54 may extend from the lower ends of the channels 51 to the channel irons 38. The braces 54 may be welded to the channels 51 and the irons 38.

The channels 52 of the rockers 24 are elongate grooved or channel-shaped members secured to the outer ends of the spokes 43 and 44 and secured to the rear ends of the channel irons 38. The channels 52 may be secured to the spokes 43 and 44 and the channel irons 38 by welds. The channels 52 are preferably longitudinally curved and the two channels are alike in shape or configuration. The channels 52 are engaged by the line 26 and the cooperation of the channels 52 and the line 26 controls the movement of the rockers 24. Accordingly, the shape or curvature of the channels 52 is important and the invention contemplates that this shape or curvature may be varied to produce any desired movement of the pump rod. Further, the ratio between the mean distances of the channels 51 and 52 from the axis of the rocking elements 24 determines the extent of multiplication or increase of the movement of the polished rod 14 over the movement of the walking beam 10 and this ratio may be varied to produce a pump rod stroke of the desired length and speed. Owing to these factors it is to be understood that the invention is not to be construed as limited to any particular curvature or shape of the channels 52 or to any specific ratio between the effective radii of the channels 51 and 52.

In Figs. 1 to 5, inclusive, of the drawings the channels 51 and 52 are related so that the movement imparted to the polished rod 14 is substantially proportional to the movement of the walking beam 10 and this stroke or movement has a length approximately 1.41 times the length of the stroke of the beam 10 so that an average stroke of 56 inches of the walking beam 10 will produce an 80 inch stroke of the polished rod 14. In the construction illustrated in the figures just mentioned the channels 52 are curved substantially concentric with the axis of rocking movement of the rockers 24 so that the rockers act as a lever having a constant length.

Fig. 7 of the drawings illustrates a typical variation in the formation of the channels 52. In this figure of the drawings the lower end portions 52^a have a radius of curvature greater than that of the upper end portions 52^b while the intermediate portions may be curved substantially concentric with the axis of the rockers 24. If channels 52 of the shape illustrated in Fig. 7 of the drawings are employed the rockers 24 act as levers having non-uniform effective lengths and serve to compensate for undesirable irregularities of movement of the pump rod that may occur due to the crank action of the walking beam mechanism. From the above it will be apparent that the speed of the pump rod stroke may be increased or decreased during any phase of the stroke by varying the distances of different portions of the channels 52 from the axis of the rockers 24. The channels 52 may be given any desired longitudinal shape to provide for any special or specific movement of the pump rod.

The bridle 25 may be a single length of cable as illustrated in the drawings. The bridle 25 has its ends secured to the polished rod 14 by a suitable clamp 56 and has two branches extending upwardly from the clamp 56 to engage in the channels 51. The upper portion of the bridle 25 is looped, as described above, to extend through the connecting channel portion 53. The bridle 25 is provided to transmit movement between the wheels 24 and the polished rod 14, as will be readily understood.

The line 26 is connected with a fixed or stationary object and engages the channels 52 of the rockers 24 to govern the oscillation of the rockers relative to the beam 10 during operation of the beam. While the line 26 may be a rigid rod-like part pivotally connected with a stationary object and with the wheels 24 it is preferably a flexible element or cable, as illustrated in the drawings. In the preferred arrangement disclosed the line 26 has its ends secured to a relatively stationary object and is looped to have two branches extend upwardly to engage in the channels 52. The ends of the line 26 may be secured to the Samson post 11. In the construction illustrated in the drawings

a bracket 57 secures the ends of the line 26 to the post 11. The bracket 57 is such that the line 26 may freely swing during oscillation of the rockers 24. A transversely extending channel portion 58 integrally connects the upper ends of the channels 52 and the line 26 has its upper portion looped to extend through this channel portion 58. The channel portion 58 has its open side facing upwardly or upwardly and forwardly so that the line 26 does not become displaced from it. The line 26 being looped in the channel portion 58, as just described, operates to aid in preventing lateral movement of the walking beam 10 and has its two branches under substantially uniform tension.

In the operation of the mechanism the walking beam 10 is operated or oscillated in the usual manner by the crank and pitman drive 18—19. Assuming that the beam 10 is in the position illustrated in Fig. 1 of the drawings and that its inner active end is moving upwardly, the rockers 24 are caused to rock or turn in a manner to impart increased upward movement to the polished rod 14. The line 26 is connected with the rockers 24 by engaging their channels 52 and the line thus serves to prevent bodily upward movement of the rear portions of the rockers with the beam 10. The result is that the rockers 24 turn on their axis between a position such as shown in Fig. 1 to a position such as shown in Fig. 2 during the movement of the walking beam 10 between its intermediate position and the upper end of its stroke. As will be apparent from an inspection of Figs. 1 and 2 of the drawings this turning of the rockers 24 on their axis adds to or increases the upward motion imparted to the bridle 25 and the polished rod 14. During the downward stroke of the active end of the walking beam 10 the above described motion of the rockers 24 is reversed. During the downward movement of the walking beam 10 the rockers 24 turn between a position such as shown in Fig. 2 of the drawings to a position such as shown in Fig. 3. This turning of the rockers 24 on their axis allows the bridle 25 to unreel from the channels 51 throughout a substantial length of the channels and thereby materially increase the downward movement of the polished rod 14. As the increased movement of the polished rod 14 occurs during the regular stroke of the walking beam 10 it is apparent that the movement of the polished rod 14 is proportionately increased in speed.

As pointed out above, the character, rate and extent of movement of the polished rod 14 may be controlled to a substantial degree by varying the effective radius or by varying the configuration of the channels 52. Variation in the radius of the channels 52 varies the extent of increase of movement of the polished rod 14 over that of the active end of the walking beam 10. By varying the shape of the channels 52 the extent and rate of movement of the polished rod 14 may be changed at any phase of the stroke of the pump to provide for the efficient operation of the pump under practically any circumstances.

Having described only a typical preferred form and application of the invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims:

Having described my invention, I claim:

1. A pump jack for operating a well pump rod comprising an oscillating element, a rocker member pivoted on the element, a part connected with the rocker member and directly connected with a relatively stationary object to effect rocking movement of the member during oscillation of the beam, and a bridle operating over the rocker member and connected with the pump rod whereby the rod is operated by the combined movements of the beam and member.

2. In combination with an oscillating element and a pump rod, a rocker pivoted on the element, a port connecting the rocker with a stationary object and having peripheral contact with the rocker whereby the rocker pivots during oscillation of the element, and means connecting the rocker and the pump rod whereby the rod is reciprocated by the combined movements of the element and rocker.

3. In combination with an oscillating element and a pump rod, a rocker pivoted on the element and having a curved peripheral guide, a member connecting the rocker with a stationary object and cooperating with the guide of the rocker to cause pivoting of the rocker during oscillation of the element, and bridle operating over the rocker and connected with the pump rod to transmit the combined movements of the beam and rocker to the rod.

4. In combination with an oscillating element and a pump rod, a rocker pivoted on the element, means associating the rocker with a relatively stationary object whereby oscillation of the element causes pivoting of the rocker, comprising a connecting member engaging over a peripheral part of the rocker and connected with said object and a flexible member connected with the rod and engaged by a peripheral portion of the rocker for transmitting movement between the rocker and the rod.

5. In combination with an oscillating element and a pump rod, a rocker pivoted on the element, a line connected with a stationary object and associated with the rocker to engage a peripheral portion thereof for the purpose of controlling rocking of the rocker during oscillation of the beam, and a flexible member connected with the pump rod and associated with the rocker to engage over a peripheral portion thereof and operable to transmit movement from the rocker to the rod.

6. In combination with an oscillating element and a pump rod, a rocker pivoted on the element, a line connected with a stationary object and associated with the rocker to engage a peripheral portion thereof for the purpose of controlling rocking of the rocker during oscillation of the beam, the contour of said peripheral portion determining the rocking movement of the rocker, and means for transmitting movement between the rocker and the pump rod.

7. In combination with an oscillating element and a pump rod, a rocker pivoted on the element, a line connected with a stationary object and associated with the rocker to engage a peripheral portion thereof for the purpose of controlling rocking of the rocker during oscillation of the beam, the contour of said peripheral portion determining the rocking movement of the rocker, and means for transmitting movement between the rocker and the pump rod, said means including a bridle connected with the rod and rocker and engaging over a peripheral portion of the rocker substantially diametrically opposite the first mentioned peripheral.

8. Mechanism for operating a well pump rod comprising, an oscillatable beam, means for oscil-

lating the beam, a rocker pivotally supported on the beam, two substantially diametrically opposite peripheral channels on the rocker, a bridle connected with the rocker engaging in one channel and connected with the pump rod to transmit movement between the rocker and rod, and a line connected with the rocker and a relatively stationary object and engaging in the other groove to effect pivoting of the rocker during oscillation of the beam.

9. Mechanism for operating a well pump rod comprising, an oscillatable beam, means for oscillating the beam, a rocker, means pivotally supporting the rocker on the under side of the beam, two curved peripheral channels on the rocker, a bridle connected with the rod and the rocker to transmit movement between them and engaging in one of said channels, and a line connected with the rocker and a stationary object to produce pivoting of the rocker and engaging in the other of said channels, said other of said channels being shaped to cause the desired pivotal movement of the rocker.

10. In combination with an oscillating beam and a well pump rod, means for transmitting movement from the beam to the rod and imparting to the rod a stroke longer than the stroke of the beam, said means including, a rocker pivotally supported by the beam, the rocker having two peripheral portions, a line connected with the rod and the rocker and cooperating with one of said portions, and a line connected with the rocker and a stationary object and cooperating with the other of said portions.

11. In combination with an oscillating beam and a well pump rod, means for transmitting movement from the beam to the rod and imparting to the rod a stroke longer than the stroke of the beam, said means including, a rocker pivotally supported by the beam, the rocker having two peripheral portions, a line connected with the rod and the rocker and cooperating with one of said portions, and a line connected with the rocker and a stationary object and cooperating with the other of said portions, the said other peripheral portion being shaped to vary the velocity of pivoting movement of the rocker.

12. In combination with an oscillating beam and a well pump rod, means for transmitting movement from the beam to the rod and imparting to the rod a stroke longer than the stroke of the beam, said means including, a rocker pivotally supported by the beam, the rocker having two peripheral portions, a line connected with the rod and the rocker and cooperating with one of said portions, and a line connected with the rocker and a stationary object and cooperating with the other of said portions, the said other peripheral portion having a non-uniform curve to vary the velocity of pivotal movement of the rocker.

13. In combination with an oscillating beam and a well pump rod, means for transmitting movement from the beam to the rod and imparting to the rod a stroke longer than the stroke of the beam, said means including, a pair of rockers, bearing means pivotally supporting the rockers on the beam to occupy positions at opposite sides of the beam, a bridle connected with the rod and having branches cooperating with outer peripheral portions of the rockers and connected with the rockers to transmit movement between the rockers and the rod, and a looped line connected with the rockers and a stationary object and having branches cooperating with the inner peripheral portions of the rockers to effect and govern pivotal movement of the rockers.

14. In combination with an oscillating beam and a well pump rod, means for transmitting movement from the beam to the rod and imparting to the rod a stroke longer than the stroke of the beam, said means including, a pair of rockers, bearing means pivotally supporting the rockers on the under side of the beam, means connecting the two rockers for simultaneous pivoting, a bridle connected with the rod and having branches cooperating with outer peripheral portions of the rockers and connected with the rockers to transmit movement between the rockers and the rod, and a looped line connected with the rockers and a stationary object and having branches cooperating with the inner peripheral portions of the rockers to effect and govern pivotal movement of the rockers.

15. In combination with an oscillating beam and a well pump rod, means for transmitting movement from the beam to the rod and imparting to the rod a stroke longer than the stroke of the beam, said means including, a pair of rockers, means supporting the rockers at opposite sides of the beam for pivotal movement about an axis at the under side of the beam, the rockers having inner and outer peripheral channels, a channel part connecting the inner channels of the two rockers, a channel part connecting the outer channels of the two rockers, a looped bridle connected with the rod, cooperating with the outer channels of the rockers and engaged in the last mentioned channel part to transmit movement between the rockers and the rod, and a looped line connected with a stationary object, cooperating with said inner channels and engaged in the first mentioned channel part to effect and govern pivotal movement of the rockers.

16. In combination with a walking beam, and a pump rod, a rocker element pivoted on the beam, a looped bridle connected with the rod, spaced channels on the element in which the bridle engages, a channel part receiving the loop end portion of the bridle to associate the bridle with the element, the cooperation of the said part and the bridle preventing lateral movement of the beam, and means connecting the rocker element with a relatively stationary object to cause pivoting of the rocker during oscillation of the beam.

17. In combination with a walking beam, and a pump rod, a rocker element pivoted on the beam, a bridle connected with the pump rod and associated with the rocker element to transmit movement between the rod and element, a looped line connected with a relatively stationary object, spaced channels on the element cooperating with the line, and a channel part on the element shiftably receiving the loop end of the line to connect the line with the element whereby the element pivots during oscillation of the beam, the cooperation of the line and said part preventing lateral movement of the beam.

CHARLES W. HALL.

CERTIFICATE OF CORRECTION.

Patent No. 2,144,149. January 17, 1939.

CHARLES W. HALL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 11, claim 2, for the word "port" read part; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of March, A.D. 1939.

Henry Van Arsdale.

(Seal) Acting Commissioner of Patents.