Aug. 16, 1938. J. E. HALL 2,126,992

PUMP JACK

Filed July 18, 1936 2 Sheets-Sheet 1

Fig. 1.

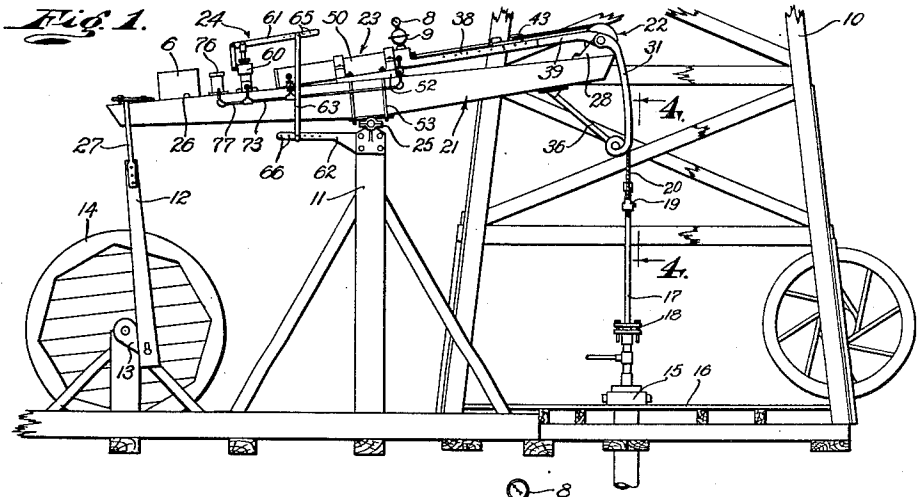


Fig. 2.

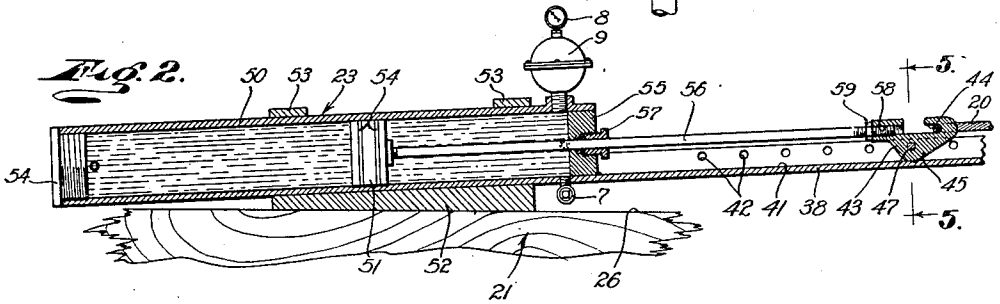


Fig. 3.

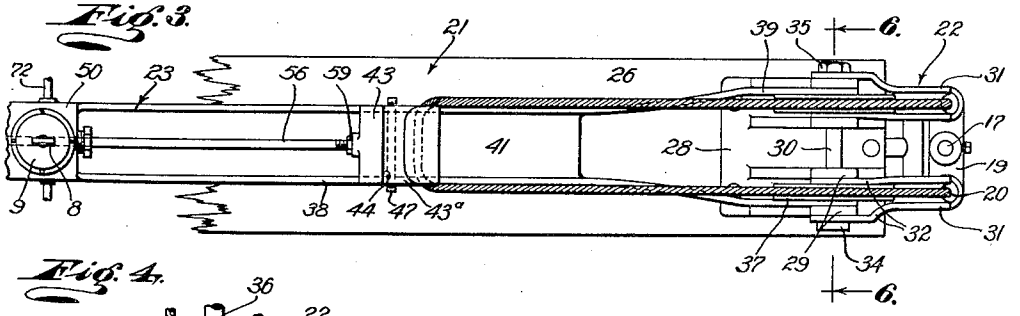


Fig. 4.

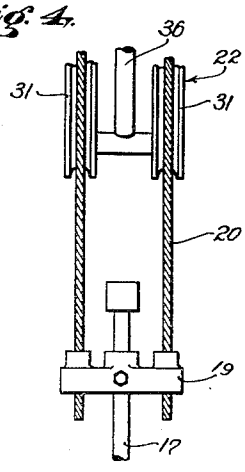
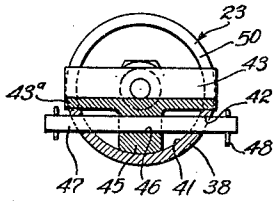


Fig. 5.



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Fig. 6.

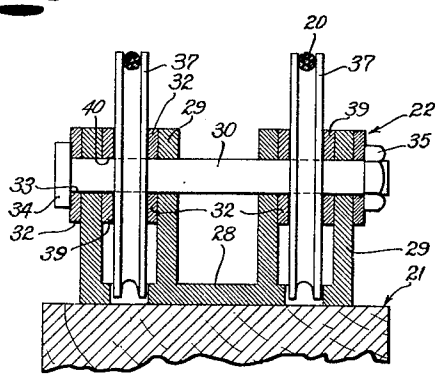
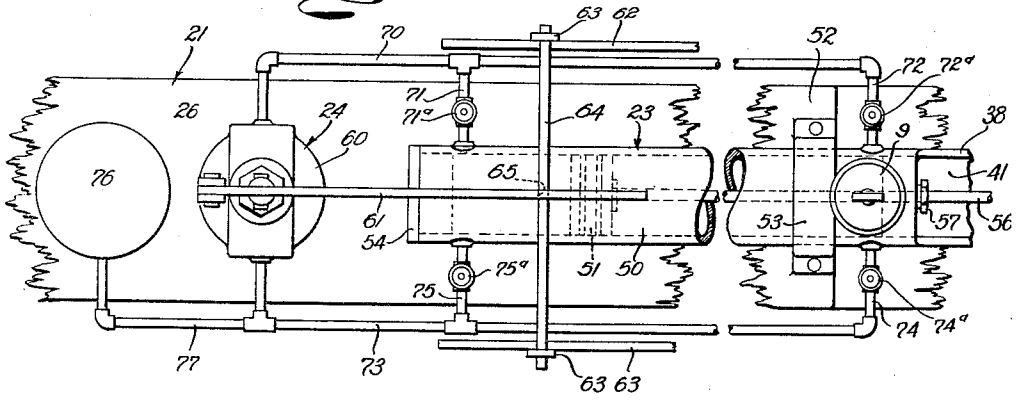


Fig. 7.



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Patented Aug. 16, 1938 2,126,992

UNITED STATES PATENT OFFICE

2,126,992

PUMP JACK

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Application July 18, 1936, Serial No. 91,337

11 Claims. (Cl. 255—15)

This invention relates to well pumping equipment and relates more particularly to a pump jack. A general object of this invention is to provide a simple, practical pump jack capable of effecting the adjustment, regulation and manipulation of the pump rods.

In the pumping of deep wells such as oil wells it is sometimes necessary to adjust the pump rods, vary the stroke of the well pump, jar the rods and manipulate the rods in other manners. The pump jacks now in general use are not provided with means for manipulating the pump rods and when adjustment or manipulation of the rods is needed it becomes necessary to tempararily install special apparatus for this purpose.

Another object of this invention is to provide a pump jack embodying practical effective means for adjusting and manipulating the pump rod or sucker rod string.

Another object of this invention is to provide the combination of a walking beam and means associated with the walking beam for adjusting and manipulating the pump rod or sucker rod string in various manners.

Another object of this invention is to provide a device or attachment for application to a typical walking beam that is operable to adjust, regulate and manipulate the pump rod or sucker rod string, as desired.

Another object of this invention is to provide a device or attachment of the character mentioned that may be supported entirely by the walking beam and the Samson post.

Another object of this invention is to provide a device of the character mentioned that may be installed on the walking beam to be immediately available at all times for the adjustment and manipulation of the pump rod or sucker rod string and the well pump.

Another object of this invention is to provide a device of the character mentioned that may be operated by movement of the walking beam so that it does not necessitate the installation of a power unit for its actuation.

Another object of this invention is to provide a device of the character mentioned that is dependable and positive in its movement and adjustment of the sucker rod string.

A further object of this invention is to provide a device of the character mentioned that is inexpensive and that may be installed on a typical walking beam with little or no alteration or modification of the beam.

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

Fig. 1 is a vertical sectional view of a typical well derrick illustrating the pump jack and the associated parts in elevation. Fig. 2 is an enlarged longitudinal detailed sectional view of the cylinder and piston mechanism and the adjacent parts of the device. Fig. 3 is an enlarged fragmentary top or plan elevation of the inner end portion of the walking beam and the parts thereon. Fig. 4 is an enlarged fragmentary end elevation taken substantially as indicated by line 4—4 on Fig. 1. Fig. 5 is an enlarged transverse detailed sectional view taken as indicated by line 5—5 on Fig. 2. Fig. 6 is an enlarged vertical detailed sectional view taken as indicated by line 6—6 on Fig. 3 showing the pulleys in elevation, and Fig. 7 is an enlarged fragmentary plan elevation of the cylinder and piston mechanism, the pump and the adjacent parts.

The device of the present invention is adapted to be embodied in or applied to well pumping equipment of various types. In the drawings I have illustrated one form of the invention applied to or embodied in a typical pump jack of the walking beam type, it being understood that the invention is not to be construed as limited or restricted to the specific form or application about to be described.

The typical well equipment illustrated in the drawings includes a derrick 10, a Samson post 11 and a pitman 12 operated by the crank 13 of a wheel or drum 14. A tubing head 15 projects from the floor 16 of the derrick 10 and the polish rod 17 of the pumping string extends upwardly through the oil saver or gland 18 of the head 15. A clamp 19 is secured to the upper portion of the polish rod 17. A bridle 20 has its opposite ends secured to the clamp 19 for the purpose of operating the sucker rod string in the manner to be hereinafter described.

The apparatus or combination provided by the present invention includes, generally, a walking beam 21 pivotally supported on the Samson post 11, means 22 on the beam 21 for engaging the bridle 20 to operate the pump rod, a cylinder and piston mechanism 23 on the walking beam 21 operatively connected with the bridle 20 and operable to adjust and manipulate the pump rod, and means 24 for operating the cylinder and piston mechanism 23.

The walking beam 21 may be of typical or standard construction. For example, it may be

formed of steel or of wood, as illustrated. The walking beam 21 is pivotally supported midway between its ends on the upper end of the Samson post 11 by a suitable saddle 25. The upper side 26 of the walking beam 21 is preferably flat. A stirrup 27 is secured to the upper end of the pitman 12 and engages over the outer end portion of the beam 11 so that the beam is oscillated or pivoted by the pitman. The walking beam 21 projects into the derrick 10 to have its inner end substantially above the tubing head 15. It is to be understood that the wheel or drum 14 may be driven by a suitable power means to oscillate or pivot the walking beam 21. A counterbalance 6 may be associated with the walking beam 21, the drum 14 or other elements of the pump jack in any of the well known manners.

The means 22 on the walking beam 21 for operatively engaging the bridle 12 may be varied considerably without departing from the spirit of the invention. In the preferred construction the means 22 includes an iron or bracket 28 secured to the upper side 26 of the beam 21 at the inner end of the beam. Spaced pairs of upwardly projecting lugs or bosses 29 are provided on the bracket 28. A pin or shaft 30 extends through transverse openings in the bosses 29 to be supported by the bosses. A horse's head or arc is provided to engage the bridle 20 to guide and direct it over the inner end of the walking beam 21. The arc includes two curved or arcuate members 31 provided with suitable grooves to receive the bridle 20. The upper end part of each member 31 is yoked to have two arms 32. One arm of each member 31 engages against the outer side of an outer boss 29 and the other arms 32 engage against the inner sides of the inner bosses 29. The arms 32 have openings 33 passing or receiving the shaft 30 whereby the shaft secures the upper ends of the members 31 to the walking beam. A head 34 is provided on one end of the shaft 30 and a nut 35 is provided on the other end of the shaft 30 to prevent the displacement of the arms 32 from the shaft and to retain the shaft in position. A rod or brace 36 is connected with the lower end portions of the members 31 and is secured to the under side of the walking beam 21 to connect the lower ends of the members 31 with the walking beam. The arc members 31 are curved about the axis of pivotal movement of the walking beam 21 so that they effect the proper operation of the bridle 20. Rotatable pulleys 37 are provided on the shaft 30 between the adjacent bosses 29. The spaced parts of the bridle 20 are arranged over the pulleys 37 whereby the bridle may be adjusted or shifted longitudinally.

The means 22 for associating the bridle 20 with the walking beam 21 further includes a part 38 at the upper side of the walking beam 21. The part 38 is rigidly connected with the beam 21 in the manner to be hereinafter described. The part 38 is in the nature of a channel or partially tubular element and extends longitudinally of the beam 21. The central longitudinal axis of the part 38 is substantially tangential with respect to a point on the upper port of a circle concentric with and of the same diameter as the grooves in the pulleys 37. Due to this pitch or inclination of the part 38 the part is spaced some distance above the upper side 26 of the walking beam. The forward end portion of the part 38 is split or divided to have two forks 39. The forks 39 are flattened and lie against the inner sides of the outermost bosses 29. Openings 40 are provided in the forks 39 to receive the shaft 30 so that the shaft secures the forward end portion of the part 38 to the walking beam 21. The longitudinal channel or opening 41 of the partially tubular part 38 has a cylindrically curved wall.

In accordance with the invention a plurality of longitudinally spaced pairs of aligned openings 42 is provided in the walls of the part 38. A saddle or connecting member 43 is shiftably arranged in the opening 41 and has a hook-like projection on its upper side providing a notch 44 which receives the loop end of the bridle 20. A rounded skid projection 45 is provided on the under side of the connecting member 43 and shiftably bears on the bottom wall of the opening 41. Relatively broad flanges 43a project from the opposite sides of the member 43 and shiftably operate along the upper edges of the parts 38 to prevent undesired tilting of the members. The member 43 is provided with a transverse opening 46. A removable pin 47 is adapted to be inserted through a pair of aligned openings 42 and the opening 46 to secure the member 43 against movement at a desired or adjusted position and thus connect the bridle 20 to the beam 21 in the selected adjustment. The pin 47 may fit the opening 46 or the openings 42 with substantial clearance. The pin 47 may be removed from the openings 42 and 46 to allow longitudinal adjustment of the member 43 in the opening 41 and adjustment of the pump rod string by the cylinder and piston mechanism 23. Cotter keys 48 or the like may be provided on the projecting opposite end portions of the pin 47 to prevent its accidental displacement.

The cylinder and piston mechanism 23 is operable to shift the member 43 longitudinally and thus effect shifting of the bridle 20 and the pump rod relative to the walking beam to adjust or otherwise manipulate the pump rod string, the well pump, or other equipment. The cylinder and piston mechanism 23 includes a cylinder 50 and a piston 51 operable in the cylinder. In accordance with the invention the cylinder 50 is carried by the walking beam 21. In the preferred construction the above described part 38 and the cylinder 50 are integral, the part 38 being an integral open extension of the cylinder. The cylinder 50 is supported on the upper side 26 of the walking beam by a suitable base or bracket 52. The bracket 52 may be arranged directly above the saddle 25 and may be secured to the walking beam by U-bolts or rods 53. The upper side of the bracket 52 is concave to receive and conform to the cylinder 50 and is inclined so that the longitudinal axis of the cylinder and the part 38 may be substantially tangential with respect to the pulleys 31 as above described. Bolted on caps 53 are provided on the bracket 52 and engage about the cylinder 50 to secure the cylinder in place. Heads 54 and 55 close the opposite ends of the cylinder 50. The head 54 may be threaded in the outer or rear end of the cylinder 50 while the head 55 may be welded in the inner end of the cylinder. The cylinder 50 is preferably comparatively long to provide for substantial adjustment of the pumping equipment.

The piston 51 of the means 23 may be of any suitable construction and may be provided with sealing rings 54 of any practical type. A rod 56 is connected with the piston 51 and extends outwardly through an opening in the head 55. A suitable packing gland 57 may be provided on the

head 55 to seal about the rod. The piston rod 56 is connected with the member 43 whereby longitudinal movement of the piston 51 is accompanied by movement of the member 43 and adjustment or movement of the string of pump rods. In practice the outer end portion of the rod 56 may be threaded in an opening 58 in the member 43 and a lock nut 59 may lock the rod against unthreading from the opening. A pressure dome 9 is preferably provided on the cylinder 50 to communicate with its inner end portion to reduce or absorb the shock to the equipment usually accompanying the pick up of the pump rod. A pressure gauge 8 is provided on the cylinder to indicate load or weight imposed by the pumping string. A normally closed threaded port or boss 7 may be provided on the cylinder 50 to communicate with its inner end portion to receive the nipple of a pressure recording or weight recording device for recording the action of the pumping equipment during the various phases of its stroke.

The means 24 for actuating the cylinder and piston mechanism 23 is preferably in the nature of a pump means although the invention contemplates the operation of the cylinder and piston mechanism 23 by fluid under pressure from any available source. In the embodiment of the invention illustrated the means 24 includes a pump 60. The pump 60 may be of the cylinder and piston type and may be mounted in any desired location. In order to eliminate the necessity of flexible fluid conduits for carrying the actuating fluid to the cylinder 50 on the movable walking beam 21 it is preferred to mount the pump 60 on the walking beam. In the particular arrangement illustrated the pump 60 is mounted on the upper side 26 of the walking beam 21 adjacent one end of the cylinder 50. The pump 60 illustrated in the drawings has an operating lever 61 projecting longitudinally of the beam 20.

It is a feature of the invention that the pump 60 may be operated by movement of the walking beam 21. Various means may be employed to effect operation of the pump 60 by the beam 21. In the particular case illustrated a pair of stationary arms 62 project laterally or horizontally from the Samson post 11 and pivoted links 63 extend upwardly from the arms. A transverse rod 64 is pivotally connected with the upper ends of the links 63 and is pivotable in an opening 65 in the lever 61. As the point of connection of the links 63 with the lever 61 is offset from the pivotal axis of the beam 21 the links 63 connecting the lever 61 with the arms 62 effect operation of the pump when the beam moves. There may be a plurality of longitudinally spaced openings 65 in the lever 61 and a plurality of longitudinally spaced openings 66 in the arms 62 to permit the regulation of the stroke of the pump 60. The openings 66 are adapted to receive the pivot pins for connecting the links with the arms 62.

A conduit 70 receives the fluid or liquid from the discharge of the pump 60 and has a branch 71 communicating with one end of the cylinder 50 and a branch 72 communicating with the other end of the cylinder. Valves 71^a and 72^a are provided in the branches 71 and 72 to control them. A conduit 73 is connected with the inlet of the pump 60 and has a branch 74 communicating with one end of the cylinder 50 and a branch 75 communicating with the other end of the cylinder. The branches 74 and 75 of the conduit 73 are controlled by suitable valves 74^a and 75^a. A reservoir 76 may be provided on the beam 21 adjacent the pump 60. A pipe 77 may connect the reservoir 76 with the conduit 73. The cylinder and piston mechanism is adapted to be actuated by a suitable liquid such as oil supplied to it under pressure by the pump 60.

During normal operation the pin 47 is arranged through the opening 46 and a pair of aligned openings 42 to connect the bridle 20 with the walking beam 21 and the walking beam is oscillated in the usual manner to effect reciprocation of the polish rod 17 and the pumping string connected therewith. The pump 60 may be disconnected or idle during the regular pumping operations. The links 63 may be disconnected from the arms 62 or rod 64 may be removed to render the pump 60 inoperative. When it is desired to change the stroke of the well pump, to adjust the pump rods or other conditions in the well, or when it is desired to otherwise manipulate the pumping string the operation of the walking beam 21 is temporarily suspended. The lever 61 of the pump 60 is operatively connected with the stationary arms 62 by the replacement and connection of the links 63 and/or rod 64. The valves 71^a, 72^a, 75^a and 74^a are then manipulated or set to provide for the operation of the piston 51 in the desired direction. For example, if it is desired to raise the pumping string the valve 75^a is opened, the valve 74^a is closed, the valve 71^a is closed and the valve 72^a is opened. The pump 60 is then operated to supply liquid under pressure to the cylinder 50 through the branch conduit 72 and its valve 72^a to effect operation of the piston 51. Where the pump 60 is provided with the operating means described above the walking beam 21 is operated by the usual operating means to effect actuation of the pump 60. When the pump 60 is in operation it supplies fluid under pressure through the branch conduit 72 and valve 72^a to move the piston 51 in a direction to lift or move the pumping string upwardly. As the bridle 20 extends over the pulleys 37 and the member 43 moves in the part 38 this movement of the pumping string by the piston 21 may be readily accomplished. The piston 51 may be moved or shifted to bring the pumping rod to the desired position or adjustment. In practice the piston 51 may be actuated by the liquid under pressure to position the member 43 where its opening 46 is aligned with a pair of openings 42. The pin 47 is then inserted through the aligned openings 42 and 46 and secured in position by the cotter keys 48. By suitably reversing the valves 71^a, 72^a, 74^a and 75^a the piston may be shifted in the opposite direction to effect downward adjustment of the rods. The adjustment of the pump rods may be slow or gradual or may be rapid, as desired. Under certain conditions it may be found desirable to operate the cylinder and piston 23 during operation of the walking beam 21 to produce a desired pumping action or stroke.

With the apparatus of the present invention the pump rods may be adjusted from time to time to compensate for their elongation and the stroke of the well pump may be very accurately controlled. The bridle 20 is normally dependably secured to the walking beam 21 and the provision of the device on the walking beam does not endanger the pump apparatus. The adjusting means may be permanently installed on the walking beam 21 to be immediately available for the adjustment and manipulation of the pumping equipment. The device or apparatus is inexpensive and may be inexpensively installed on a typical walking beam.

The cylinder and piston mechanism 23 may

be employed for the shifting and manipulation of various equipment at the derrick. For example, when the bridle 20 is disconnected from the polish rod 17 a line may be connected with the bridle or the member 34 and may be connected with the object to be moved or manipulated whereupon the cylinder and piston mechanism 23 may be operated to effect the desired manipulation of the object. In this manner the counterbalance 6, as well as various other heavy objects, may be moved and positioned as desired. The walking beam 21 may be swung from its operative position where it projects into the derrick 10 to an inoperative position out of the derrick by means of the cylinder and piston mechanism 23. It is to be understood that the cylinder and piston mechanism 23 and the various other elements of the invention may be employed in connection with pump jacks of various natures and the invention is not to be construed as restricted to application to or embodiment in the typical walking beam type of pump jack illustrated. The apparatus is readily adaptable for application to pumping equipment of various characters. The cylinder and piston mechanism 23 may be actuated by fluid under pressure supplied to it from a source of fluid pressure remote from the walking beam or pump jack proper. When the cylinder and piston mechanism 23 is actuated by fluid pressure from a remote source the pump 60 and the associated parts may be dispensed with. The cylinder and piston mechanism 23 provided with the pressure gauge 8 and the boss 7 for receiving a weight recording device may be utilized to accurately determine the action of the pumping equipment and the weight on the pump rod during various stages of operation of the equipment. These devices associated with the cylinder and piston mechanism 23 may be employed to accurately determine the proper speed at which the pump should be operated, to determine when the well is sanded up, to determine when the pump rod is broken, to determine the producing conditions of the well, as well as other factors of the pumping operation.

Having described only a typical preferred form and application of my 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 including, an oscillating element, means releasably connecting the rod with the element to be reciprocated thereby, and fluid pressure means for adjusting the rod when the first mentioned means is released.

2. A pump jack for operating a well pump rod including, an oscillating element, means releasably connecting the rod with the element to be reciprocated thereby, and fluid pressure means on the element for manipulating the rod when the first mentioned means is released.

3. A pump jack for operating a well pump rod including, an oscillating element, means releasably connecting the rod with the element to be reciprocated thereby, and a cylinder and piston mechanism on the element for shifting the rod when the said means is released.

4. A pump jack for operating a well pump rod including, an oscillating element, means for releasably connecting the rod with the element to be operated thereby, fluid pressure actuated means for shifting the rod when the first mentioned means is released, and means actuated by the element for supplying fluid under pressure to the fluid pressure actuated means.

5. A pump jack for operating a well pump rod including, a walking beam, means for releasably connecting the rod with the beam to be operated thereby, fluid pressure actuated means for shifting the rod when the first mentioned means is released, and means actuated by the beam for supplying fluid under pressure to the fluid pressure actuated means, the two last mentioned means being carried by the beam.

6. A pump jack for operating a well pump rod including, a walking beam, means for releasably connecting the rod with the beam to be operated thereby, fluid pressure actuated means for shifting the rod when the first mentioned means is released, a pump for supplying actuating fluid under pressure to the fluid pressure means, and means operated by the beam for actuating the pump.

7. A device for use on a walking beam for handling the pump rod operated thereby, said device including, a cylinder on the beam, a piston operable in the cylinder, a pump on the beam for supplying liquid under pressure to the cylinder, and means for operatively connecting the piston with the pump rod including a cable having its opposite ends connected with the pump rod, the cable being trained to constitute a loop, and a member movable with the piston and engaging the cable loop.

8. A device for use on a walking beam for handling the pump rod operated thereby, said device including, a cylinder on the beam, a piston operable in the cylinder, a member connected with the rod and the piston whereby the piston is operable to move the rod, and releasable means for connecting the member with the beam in any one of a plurality of positions whereby the rod is operable by the beam.

9. A pump jack for operating a well pump rod having a bridle including, a walking beam, a guide part on the beam, a member connected with the bridle and shiftable on the guide part, releasable means for connecting the member with the guide part in any one of a plurality of positions whereby the rod is operated by the beam, and a separate means for shifting the member when said means is released.

10. A pump jack for operating a well pump rod having a bridle including, a walking beam, a guide part on the beam, a member connected with the bridle and shiftable on the guide part, releasable means for connecting the member with the guide part in any one of a plurality of positions whereby the rod is operated by the beam, and a cylinder and piston mechanism on the beam for shifting said member when said means is released.

11. A pump jack for operating a well pump rod having a bridle including, an oscillating element, a guide part on the element, a member connected with the bridle and shiftable on the guide part, releasable means for connecting the member with the guide part in any one of a plurality of positions whereby the rod is operated by the element, and means for shifting the member when said means is released, the last mentioned means including a cylinder on the element, a piston operable in the cylinder, a rod connecting the member and the piston, and means for supplying actuating fluid pressure to the cylinder.

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