July 13, 1926. 1,592,391

E. E. STEVENSON

PUMPING JACK

Filed August 18 1925 2 Sheets-Sheet 1

Fig 1.

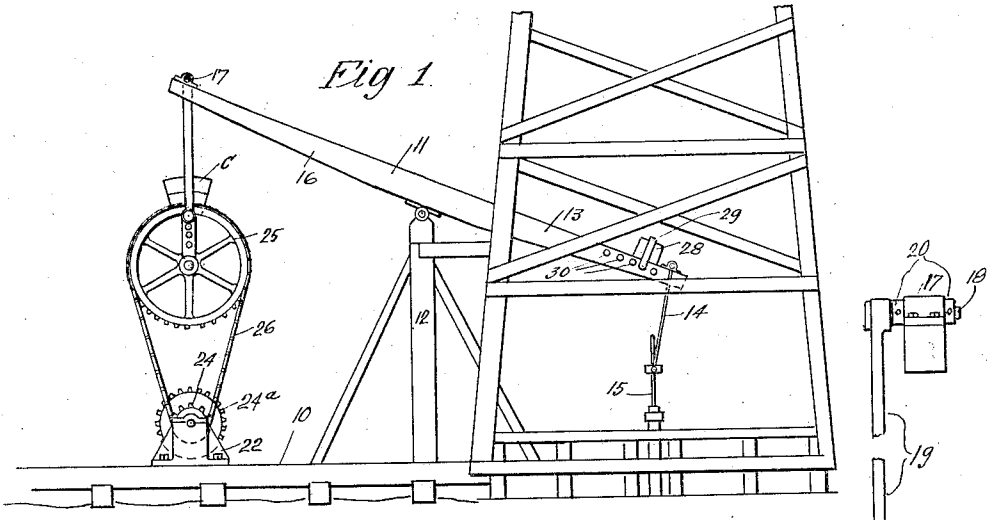


Fig 2.

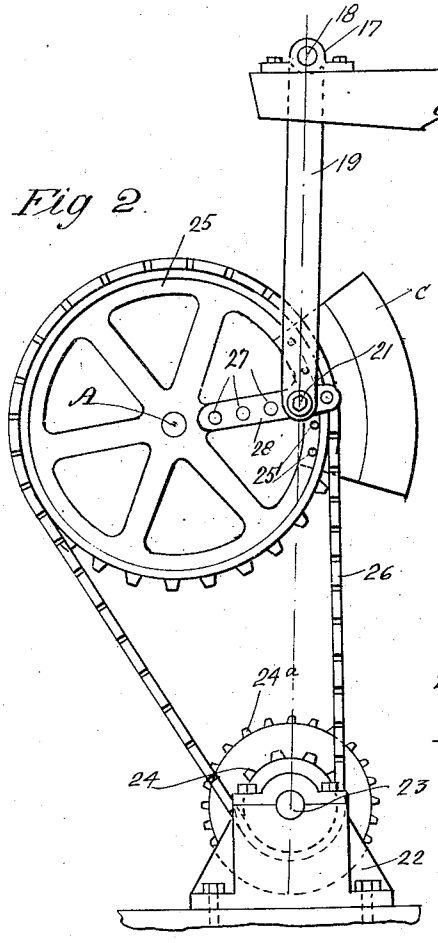
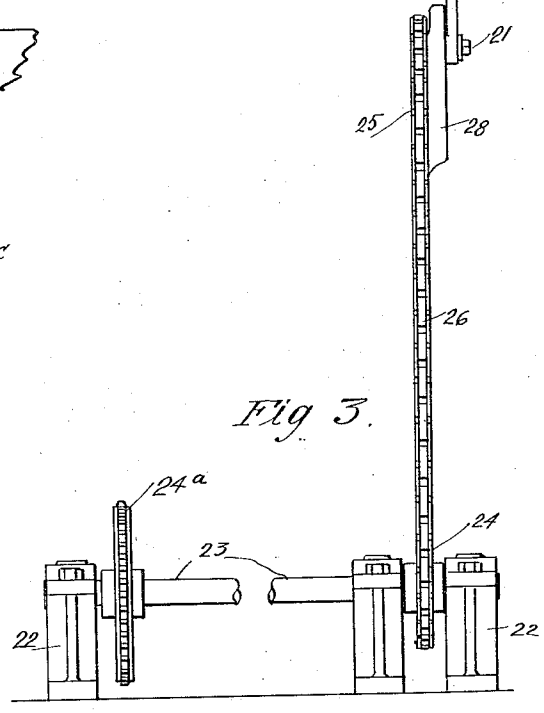


Fig 3.



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Fig. 4.

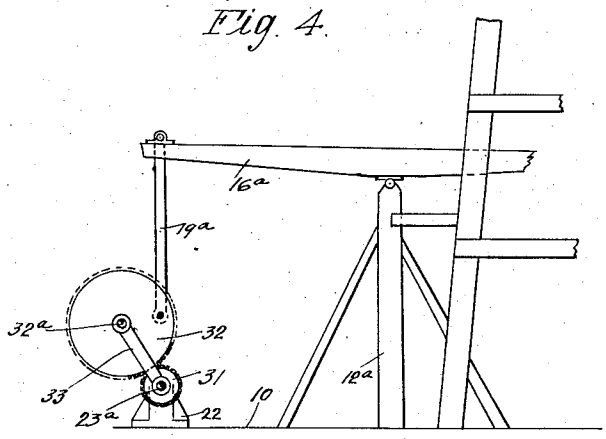


Fig. 5.

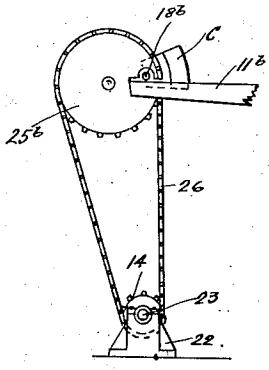
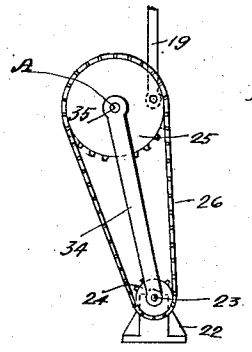


Fig. 6.



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Patented July 13, 1926. 1,592,391

UNITED STATES PATENT OFFICE.

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PUMPING JACK.

Application filed August 18, 1925. Serial No. 50,930.

This invention has to do generally with pumping apparatus and is more particularly concerned with pumping jacks used for reciprocating deep well pumps of the plunger type.

It is particularly desirable that the pumping stroke be comparatively slow and of considerable length, but this is difficult, in fact, practically impossible of accomplishment when using the ordinary walking beam type of jack. This is mainly for the reason that the extreme changes in angularity between connecting rod and beam occurring when the pumping stroke is of exceptional length, prohibitively reduce the efficiency of the devices. The radial movement of the walking beam together with the necessary traversing movement of the crank end of the connecting rod bring about the variable angularity of beam and rod, and it is this aggregate relative movement between rod and beam that renders usual walking beam types of jacks unsuited for long-stroke plunger pumps.

Therefore, it is the general object of the present invention to provide a walking beam type of jack wherein the variable angularity between beam and connecting rod is reduced to such an extent that the jack is capable of delivering relative long, slow strokes to the associated pump rod. I do this by practically eliminating lateral movement of the crank end of the connecting rod, that is, with the rod initially in vertical position, operation of the jack reciprocates the connecting rod through a substantially vertical, straight line path. How this is done may be better understood from the following detailed specification.

It is also my purpose to provide an efficient jack of the type described which is relatively easily and cheaply manufactured, and of extremely simple construction.

Reference will be made to the accompanying drawings, in which:

Fig. 1 is an elevation of a typical walking beam jack with one embodiment of my invention shown in connection therewith;

Fig. 2 is an enlarged fragmentary view, with parts broken away and contracted, of the mechanism in changed position;

Fig. 3 is a side elevation of Fig. 2 as viewed from the left thereof;

Fig. 4 is a view of a variational embodiment of the invention;

Fig. 5 is another variational embodiment; and

Fig. 6 is still another variational embodiment.

A typical derrick flooring is indicated at 10, but it will be understood that while I have specified such a flooring in my claims in order to relatively locate the various elements, this is not to be construed as in any way limitative on said claims, for the elements may be supported on any suitable type of foundation.

Walking beam 11 is mounted for oscillation on the floor supported Samson post 12 in the usual manner, the work arm 13 of the beam carrying any suitable type of suspension device 14 for pump rod 15, the latter being connected through the usual line of sucker rods (not shown) to the pump plunger (not shown) all in a manner whereby the upstroke of arm 13 lifts the plunger, while the rods and plunger are allowed to gravitate during the down stroke of said arm.

The power arm 16 of the beam has a bearing 17 which rotatably supports cross pin 18 on the end of connecting rod 19, collars 20 holding the pin from longitudinal displacement. Rod 19 is disposed at one side of arm 16 and carries at its lower end a removable bolt 21 which extends horizontally oppositely from pin 18.

Anchored on floor 10 beneath the beam are pillow blocks 22 for power shaft 23, sprocket 24^a or any suitable substitute providing means for transmitting rotary movement to the shaft from a power source (not shown).

Shaft 23 carries drive sprocket 24. A relatively large and bodily movable driven sprocket is shown at 25, there being a chain 26 adapted to drivingly connect the sprockets 24, 25. Connecting rod 19 is adapted to

be connected to sprocket 25 by passing pin 21 through any one of the holes 27 provided in the spider arm 28 of the sprocket, these holes being located at varying radially measured distances from the sprocket's axis of rotation A. The several holes 27 provide adjustment for varying the stroke of the beam.

The work on the end of beam arm 13 is of such effective down-bearing force that arm 16 is constantly urged upwardly with sufficient force to support sprocket 25 and maintain chain 26 under constant tension.

Preferably, sprocket 25 is counterbalanced by weight C which is affixed thereto at 25', for instance; said weight preferably being located so its center of gravity lies approximately in the line of centers of sprocket 25 and bolt 21. The purpose of this counterbalance is self-evident.

It will be seen that with this condition existing, rotation of sprocket 24 causes coincident rotation of sprocket 25 and that the last named sprocket will move to and fro through a circumferential path, determined by chain 26, about sprocket 24 as a center, the upthrusting force of arm 16 holding sprocket 25 to circumferential, bodily movement through the predetermined path. Rotation of sprocket 25 causes reciprocation of rod 19 and hence oscillation of beam 11, the coincident circumferential movement of the sprocket allowing rod 19 to reciprocate through a substantially straight-line vertical path, thus reducing the variation in angularity between the connecting rod and walking beam to a minimum.

In order that there may always be assured sufficient down bearing force on arm 13 to support sprocket 25 and hold the chain tight, I may provide a weight 28 on said arm, the weight being shiftable therealong to vary its effect and having a strap 29 whereby it may be bolted to the beam in any one of a number of adjusted positions, as determined by bolt holes 30 provided in the beam. Of course, any other suitable means, preferably adjustable, may be employed for holding the weight to the beam, without departing from the spirit and scope of the invention.

In Fig. 4 I have illustrated a modification wherein intermeshing drive gear 31 and driven gear 32 are substituted for sprockets 24 and 25, respectively, the arrangement otherwise being similar to Fig. 1 except that no drive chain is necessary, while a radius rod 33 is provided between shaft 23^a and a central stub shaft 32^a on gear 32. This rod holds the gears in mesh but allows the requisite bodily circumferential movement of gear 32 about gear 31.

Fig. 6 illustrates an embodiment of the device similar to Fig. 1, but shows a radius rod 34 between shaft 23 and central stub shaft 35 on sprocket 25, there then being no necessity for depending upon the down bearing force on work arm 13 to hold the drive chain under tension, though there must be sufficient weight there applied to keep the weight of the sprocket from pulling the beam down.

In Fig. 5 is shown a variational embodiment of the invention, wherein driven sprocket 25^b is directly applied to beam 11^b rather than through a connecting rod; shaft 18^b combining the described function of shafts 18 and bolt 21 in the embodiment illustrated in Figs. 1 and 2.

It will be understood the drawings and description are to be considered merely as illustrative of and not restrictive on the broader claims appended hereto, for various changes in design, structure and arrangement may be made without departing from the spirit and scope of said claims.

I claim:

1. A pump jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotatable drive wheel in fixed position on the flooring beneath the beam, means for imparting rotary movement to the drive wheel, a rotatable driven wheel intermediate the beam and driving wheel, said driven wheel being bodily movable to and fro through a predetermined circumferential path about the drive wheel as a center, means for holding the driven wheel to bodily movement through said path, drive connective means between the wheels, and a connecting rod connecting the beam and driven wheel, said connecting rod being applied to the wheel at a point radially spaced from its axis of rotation; all in a manner whereby rotation of the drive wheel imparts oscillatory movement to the walking beam.

2. A pumping jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotatable drive sprocket in fixed position on the flooring beneath the beam, means for imparting rotary movement to the drive sprocket, a rotatable, bodily movable driven sprocket intermediate the beam and driving wheel, said driven sprocket being movable bodily to and fro through a predetermined circumferential path about the drive sprocket as a center, means for holding the driven sprocket to bodily movement through said path, a drive chain connecting the sprockets, a connecting rod connecting the beam and driven sprocket, said connecting rod being applied to said sprocket at a point radially spaced from its axis of rotation, all in a manner whereby rotation of the drive wheel imparts oscillatory movement to the walking beam.

3. A pumping jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotatable drive sprocket in fixed position on the flooring beneath the beam,

means for imparting rotary movement to the drive sprocket, a rotatable, bodily movable driven sprocket intermediate the beam and driving wheel, said driven sprocket being movable bodily to and fro through a predetermined circumferential path about the drive sprocket as a center, a drive chain connecting the sprockets, a connecting rod connecting the power arm of the beam and the driven sprocket, said connecting rod being applied to said sprocket at a point radially spaced from its axis of rotation, and means for applying weight to the work arm of the beam in a manner to support the driven sprocket through the connecting rod, and thereby constantly maintain said chain under tension.

4. A pumping jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotable drive sprocket in fixed position on the flooring beneath the beam, means for imparting rotary movement to the drive sprocket, a rotatable, bodily movable driven sprocket intermediate the beam and driving wheel, said driven sprocket being movable bodily to and fro through a predetermined circumferential path about the drive sprocket as a center, a drive chain connecting the sprockets, said chain being adapted to determine the circumferential path of the driven sprocket, a connecting rod connecting the power arm of the beam and the driven sprocket, said connecting rod being applied to said sprocket at a point radially spaced from its axis of rotation, and means for applying weight to the work arm of the beam in a manner to support the driven sprocket through the connecting rod and thereby constantly maintain said chain under tension.

5. A pumping jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotatable drive sprocket in fixed position on the flooring beneath the beam, means for imparting rotary movement to the drive sprocket, a rotatable, bodily movable driven sprocket intermediate the beam and driving wheel, said driven sprocket being movable bodily to and fro through a predetermined circumferential path about the drive sprocket as a center, a drive chain connecting the sprockets, a connecting rod connecting the power arm of the beam and the driven sprocket, said connecting rod being applied to said sprocket at a point radially spaced from its axis of rotation, and a weight applied to the work arm of the beam for holding it in a manner to support the driven sprocket through the connecting rod and thereby constantly maintain said chain under tension.

6. A pumping jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotatable drive sprocket in fixed position on the flooring beneath the beam, means for imparting rotary movement to the drive sprocket, a rotatable, bodily movable driven sprocket intermediate the beam and driving wheel, said driven sprocket being movable bodily to and fro through a predetermined circumferential path about the drive sprocket as a center, a drive chain connecting the sprockets, a connecting rod connecting the power arm of the beam and the driven sprocket, said connecting rod being applied to said sprocket at a point radially spaced from its axis of rotation, and a weight adjustably applied to the work arm of the beam for holding it in a manner to support the driven sprocket through the connecting rod and thereby constantly maintain said chain under tension.

7. A pumping jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotatable drive sprocket in fixed position on the flooring beneath the beam, means for imparting rotary movement to the drive sprocket, a rotatable, bodily movable and counterbalanced driven sprocket intermediate the beam and driving wheel, said driven sprocket being movable bodily to and fro through a predetermined circumferential path about the drive sprocket as a center, a drive chain connecting the sprockets, a connecting rod connecting the power arm of the beam and the driven sprocket, said connecting rod being applied to said sprocket at a point radially spaced from its axis of rotation, and means for applying weight to the work arm of the beam in a manner to support the driven sprocket through the connecting rod, and thereby constantly maintain said chain under tension.

8. A pumping jack embodying a walking beam mounted for oscillation above a derrick flooring, a rotatable drive sprocket in fixed position on the flooring beneath the beam, means for imparting rotary movement to the drive sprocket, a rotatable, bodily movable and counterbalanced driven sprocket intermediate the beam and driving wheel, said driven sprocket being movable bodily to and fro through a predetermined circumferential path about the drive sprocket as a center, a drive chain connecting the sprockets, said chain being adapted to determine the circumferential path of the driven sprocket, a connecting rod connecting the power arm of the beam and the driven sprocket, said connecting rod being applied to said sprocket at a point radially spaced from its axis of rotation, and means for applying weight to the work arm of the beam in a manner to support the driven sprocket through the connecting rod and thereby constantly maintain said chain under tension.

9. A pump jack embodying a walking beam mounted for oscillation, a rotatable drive sprocket fixed against bodily movement

with respect to the beam, means for imparting rotary movement to the drive sprocket, a driven sprocket connected to and supported by the beam and being bodily movable to and fro through a predetermined circumferential path about the drive sprocket as a center, and a drive chain connecting the sprockets; the effective point of connection between the beam and driven sprocket being radially spaced from the axis of rotation of said driven sprocket.

In witness that I claim the foregoing I have hereunto subscribed my name this 30 day of July 1925.

EDWARD E. STEVENSON.