

May 9, 1933.

A. G. ANDREWS

1,908,653

PUMPING UNIT

Filed Nov. 7, 1931

2 Sheets-Sheet 1

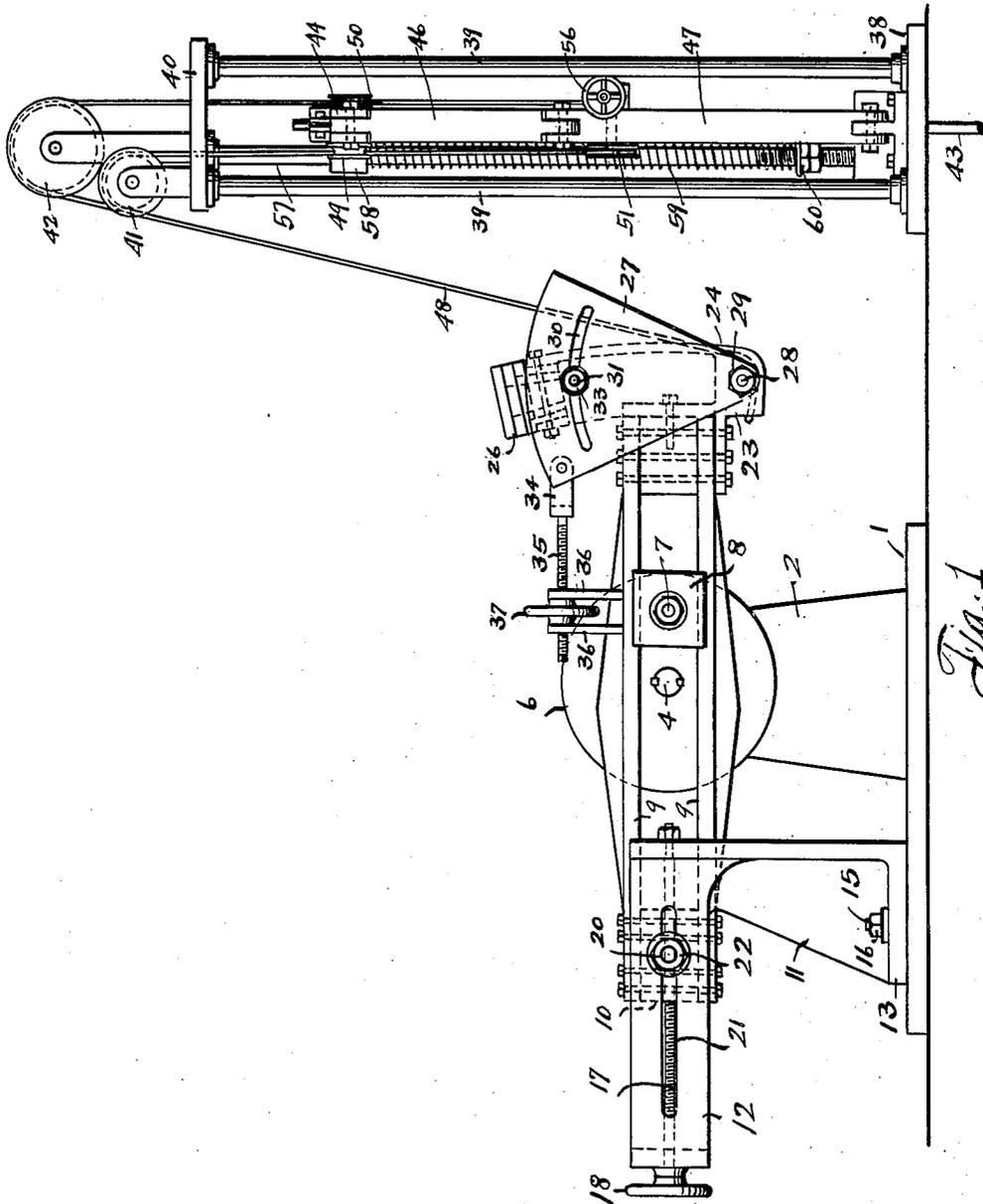


Fig. 1.

Inventor

Alexander G. Andrews,

384

Hardway Tatters
Attorneys

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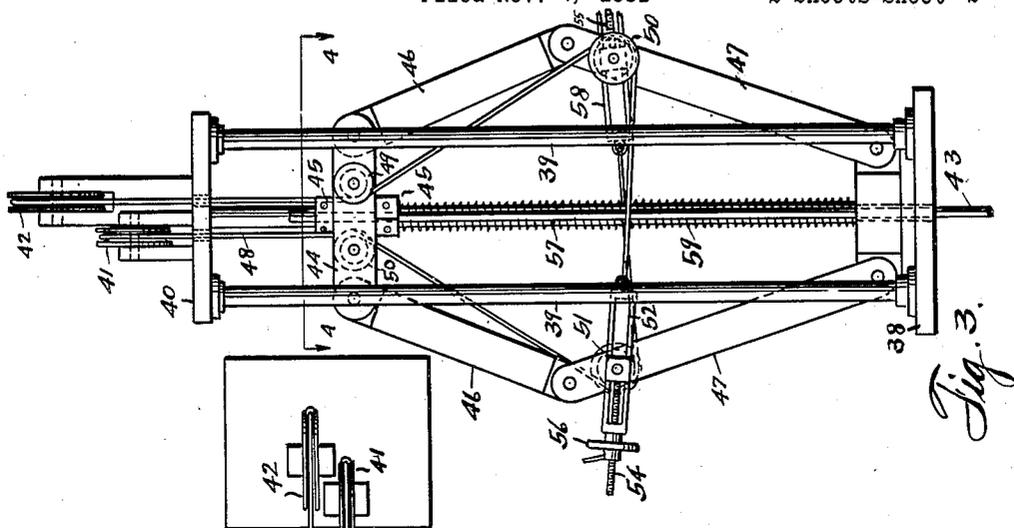


Fig. 3.

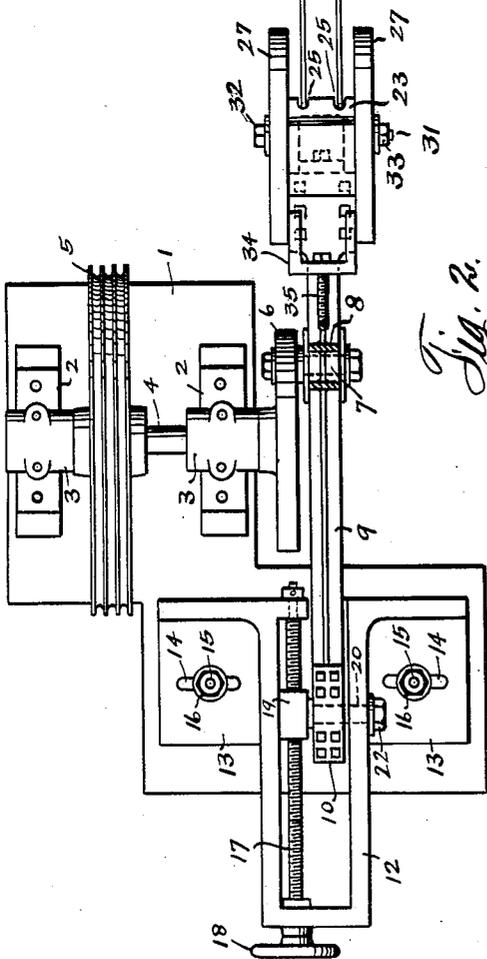


Fig. 2.

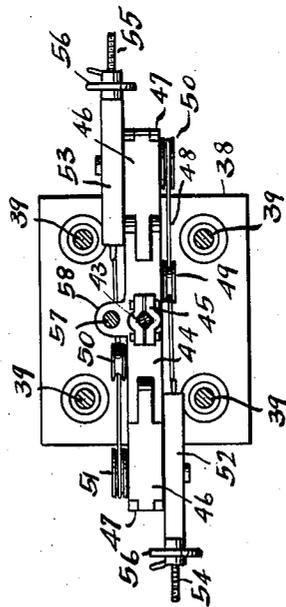


Fig. 4.

Inventor
Alexander G. Andrews

Hardway Ketcher
Attorney

UNITED STATES PATENT OFFICE

ALEXANDER G. ANDREWS, OF LUFKIN, TEXAS

PUMPING UNIT

Application filed November 7, 1931. Serial No. 573,632.

This invention relates to a pumping unit.

An object of the invention is to provide apparatus specially designed for operating a deep well pump.

Another object of the invention is to provide a pumping unit of such construction that it may be operatively connected to the pump sucker rod by means whereby the rod will be reciprocated on a true vertical line to prevent the side movement of the sucker rod and the consequent friction of said rod against its stuffing box, thus reducing the wear of the rod.

Another object of the invention resides in the provision of a pumping unit, of the character described, embodying a toggle lever construction and means for actuating the levers to impart a reciprocatory movement of the pump sucker rod.

Another object of the invention is to provide in a pumping unit, a novel type of walking beam operatively connected with the power in a novel manner.

A still further feature of the invention resides in the provision of a novel means for counterweighting the pump.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings wherein:

Figure 1 shows a side view of the complete unit as operatively connected to a pump sucker rod.

Figure 2 shows a plan view partly in section.

Figure 3 shows a front elevational view, and

Figure 4 shows a horizontal cross sectional view taken on the line 4-4 of Figure 3.

Referring now more particularly to the drawings wherein like numerals of reference designate similar parts in each of the figures the numeral 1 designates a suitable base upstanding from which are the spaced standards 2, 2 which support the crank shaft bearings 3, 3 in which the crank shaft 4 is mounted to rotate. Fixed on the shaft 4 be-

tween said bearings there is a grooved pulley 5 to receive a driving belt or cable, from a suitable power source. It is to be understood that the crank shaft 4 may be driven in any selected manner. Fixed on the inner end of the crank shaft 4 is a fly wheel 6 having the eccentric wrist pin 7 mounted on which is the cross head 8, which runs in the track 9, of the pivotally mounted walking beam 10.

Secured on the base 1 and upstanding therefrom are the legs 11, 11 whose upper ends support the outwardly extended U-shaped bracket 12 which is preferably formed integrally with said legs. The lower ends of the legs are formed with the base flanges 13, 13 having the aligned transverse slots 14, 14 through which the bolts 15, 15, which upstands from the base plate 1, extend, the upper ends of said bolts being threaded to receive the securing nuts 16 thus providing for the lateral adjustment of the bracket 12. There is an adjusting shaft 17, mounted to rotate in suitable bearings in the bracket 12, which has a hand wheel 18 or other selected means for rotating said shaft. The shaft 17 is outwardly threaded and on it is mounted the head 19 which has a threaded connection therewith. Extending laterally from said head 19 there is the bearing rod 20 on which the outer end of the walking beam 10 is pivoted. The outer end of the rod 20 extends through a longitudinal slot 21 in the bracket 12 and has the retaining nut 22 threaded thereon.

It is obvious that as the momentum wheel 6 revolves the cross head 8 will move back and forth in the track 9 of the walking beam 10, and said walking beam will be thereby oscillated in a vertical plane. By rotating the shaft 17, it is obvious that said walking beam may be adjusted relative to the cross head 8 and the range of movement of the opposite end of said walking beam may be varied thus varying the pump stroke.

Suitably secured to the free end of the walking beam there is a casting 23 which is elongated vertically and whose forward face 24, is arcuate and is provided with the vertical grooves 25, 25. A counterweight as 26 may be mounted upon the upper end of this

casting and secured thereon in any selected manner. This counterweight is formed of sections and by the addition or removal of a section or sections of the counterweight its influence in counterweighting the pump may be varied. There are the additional adjustable, segmental, counterweights 27, 27 whose lower ends are pivotally mounted on a cross bolt 28 which extends through the lower end of the casting 23 and whose outer ends are threaded to receive the retaining nuts 29, 29. The counterweights 27 are flared upwardly and their upper ends have the arcuate slots 30. A cross bolt 31 is fitted through a suitable bearing in the casting 23 and through the slots 30 and one end of which is provided with the head 32 and whose other end is threaded to receive a retaining nut 33. There is a cross yoke 34 pivotally mounted between the upper ends of the weights 27 and an outwardly threaded adjusting shaft 35 is connected at one end, to said yoke. This shaft extends through the bearings 36, 36 on the walking beam and between said bearings and threaded on the shaft 35 is the adjusting hand wheel 37. By loosening the nut 33 and by appropriately turning the hand wheel 37 the upper ends of the weights 27 may be adjusted toward or from the pump and said weights may be fixed at the selected point of adjustment by tightening up the nut 33. The counterweighting effect of these weights on the pump may be thus varied.

Over the mouth of the well to be pumped there is a suitable base plate 38 upstanding from which are the supporting posts 39, 39 whose upper ends support the head plate 40. On this head plate are mounted the rotatable sheaves 41, 42. There is a pump sucker rod 43 which extends down into the well and whereby the pump is operated. A suitable cross yoke 44 is clamped on the sucker rod by suitable upper and lower clamps 45, 45 and the upper toggle levers 46, 46 have their upper ends pivoted to opposite ends of the yoke 44. The lower ends of these upper toggle levers 46 are pivoted to upper ends of the lower toggle levers 47 and the lower ends of these last mentioned toggle levers are pivoted to the base plate 38.

There is an operating cable 48 which is looped around the lower end of the casting 23 and whose runs work in the grooves 25 and over the sheaves 41, 42. The runs of this operating cable operate around the inner sides of the sheaves 49, 50 on the yoke 44 and thence around the sheaves 50, 51 on the corresponding toggle levers 47 and the free ends of said runs of said cable 48 are attached to the opposite toggle levers 47. This attachment is effected through the slidably mounted yokes 52, 53 which are mounted on said respective toggle levers 47, and which may be adjusted thereon by means of the adjusting hand wheels 56. By suitably turning said hand

wheels 58 their corresponding yokes may be adjusted and the slack in the corresponding ends of the cable taken up to the end that the tension on the runs of the cable may be maintained equal.

There is a vertical guide rod 57 on the base 38 and the yoke 44 has a bearing 58 which runs on said rod 57. There is a coil spring 59 around the rod 57 and interposed between the bearing 58 and the adjusting nut 60 which is threaded onto said rod 57 and by means of which the compression of the spring 59 may be regulated. This spring serves as a shock absorber upon down stroke of the pump and assists in the upstroke thereof.

In operation as the shaft 4 rotates the walking beam 10 will be oscillated. Upon down stroke of said walking beam the toggle levers 46, 47 will be actuated in an obvious manner to elevate the yoke 47 and the sucker rod 43 thus effecting a power stroke of the pump. At the end of the power stroke the sucker rod will move downwardly by gravity, but in this downward movement will be balanced by the weights 26, 27 to the end that the sucker rod will not drop too suddenly and the spring 59 also acts to retard the downward movement of the sucker rod and to absorb the shock of such downward movement. The weights 26, 27 also assist in the power stroke of the pump in the usual manner.

A pumping unit of the character described will operate very smoothly, will be capable of developing great lifting power for operating the pump on power stroke and will operate the sucker rod of the pump on a true vertical line.

The drawings and description disclose what is now considered to be a preferred form of the invention by way of illustration only while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. In a pumping unit a yoke adapted to be connected to a pump rod and having a bearing, toggle levers connected to said yoke and operable to elevate, and to permit the lowering of, said yoke and the rod to which the yoke is connected, a fixed, vertical guide rod on which said bearing runs and forming guide means for said yoke for guiding the same vertically.

2. In a pumping unit a yoke adapted to be connected to a pump rod and having a bearing, toggle levers connected to said yoke and operable to elevate, and to permit the lowering of, said yoke, and the rod to which the yoke is connected, a fixed guide rod on which the bearing works for said yoke for guiding the same vertically, and a resilient member around said rod on which the yoke is supported.

3. A pumping apparatus comprising a pivotally mounted walking beam, means for oscillating said beam, means for bodily adjust-

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- ing said beam relative to said oscillating means, series of toggle levers, means for connecting said levers to a vertically reciprocable pump rod, a flexible member operably connecting said beam to said levers whereby the levers may be actuated to lift, and to permit the descent of, said rod.
4. A pumping apparatus comprising a walking beam pivoted at one end, an adjustable counter-balancing weight supported on the other end of said beam, means for adjusting said weight relative to said beam, a system of operating levers, means for connecting said levers to a vertically reciprocable pump rod, and a flexible operating member connecting said beam to said levers.
5. A pumping apparatus comprising a walking beam, supporting means on which the beam is pivoted to oscillate vertically, means for connecting said beam to a vertically reciprocable pump rod, whereby the rod may be reciprocated, means connected to the beam for oscillating the same and means for adjusting said beam and its supporting means, relative to said oscillating means whereby the range of movement of the beam may be varied.
6. A pumping unit comprising an oscillating beam, an adjustable member on which the beam is pivotally mounted, a revolving member operatively connected with the beam whereby the latter may be oscillated, means for sliding said adjustable member and beam relative to said revolving member whereby the stroke of the beam may be varied, and means for operatively connecting said beam with the pump to be operated.
7. In a pumping unit, a pivotally mounted walking beam, a counter weight pivoted thereon and means on the beam for swinging said weight into different positions relative to the beam.
8. In a pumping unit a pivotally mounted walking beam, an end casting thereon having an arcuate, grooved, end face, a weight on said casting, and a weight pivotally mounted on said beam and swingable into different positions of adjustment.
9. In a pumping unit a yoke adapted to be connected to the sucker rod of a pump and having a bearing, toggle levers connected to said yoke, means for actuating the levers to lift said yoke and rod, a guide rod along which the yoke bearing moves, and resilient means beneath the yoke for cushioning the downward movement of said sucker rod.
10. In a pumping unit, a walking beam, a bearing rod on which one end of the walking beam is pivoted, a support upon which said bearing rod is slidably mounted, an adjusting shaft having a threaded connection with said bearing rod and rotatable to adjust said rod, means oscillating said beam and means for operatively connecting the beam with the pump to be operated.
11. In a pumping unit, a walking beam, a bearing rod on which one end of the beam is pivoted, means for operatively connecting the other end of the beam to a pump to be operated, an adjustable weight on the last mentioned end of said beam, means for oscillating the beam, a support in which the bearing rod is slidably mounted, a rotatable adjusting shaft having a threaded connection with said rod.
- In testimony whereof I have signed my name to this specification.
- ALEXANDER G. ANDREWS.

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