

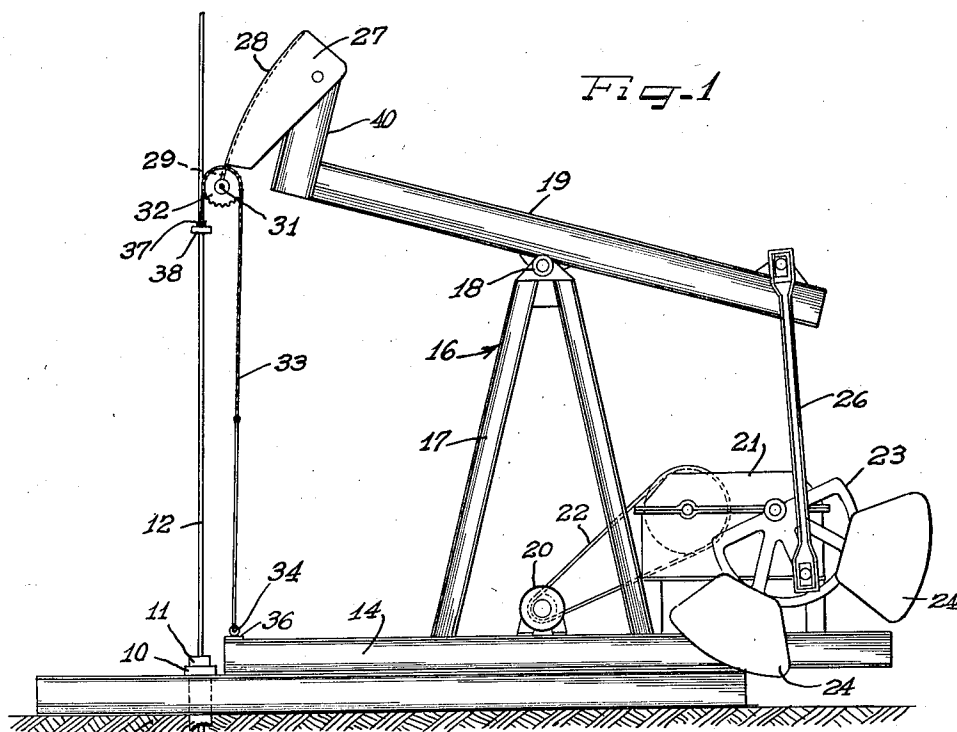
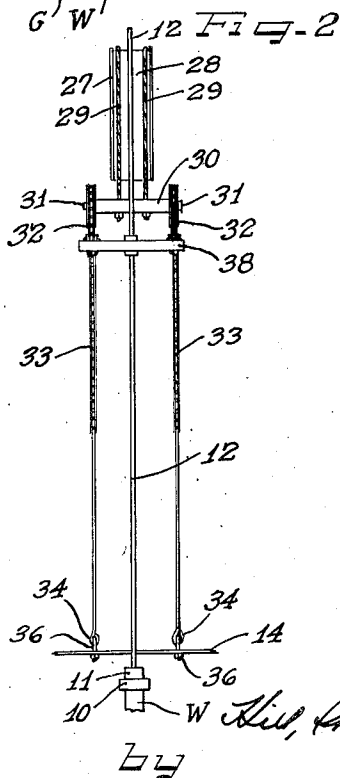
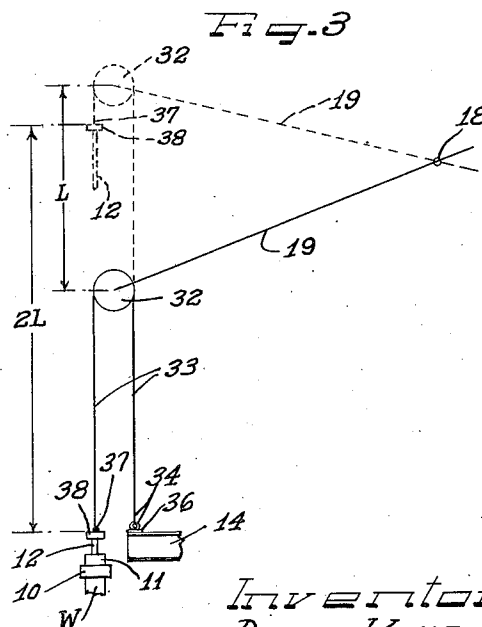
Sept. 10, 1957

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2,805,580

DOUBLE STROKE PUMPING ATTACHMENT FOR A WELL PUMPING APPARATUS

Filed Jan. 15, 1953



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1

2,805,580

DOUBLE STROKE PUMPING ATTACHMENT FOR A WELL PUMPING APPARATUS

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Application January 15, 1953, Serial No. 331,415

4 Claims. (Cl. 74-108)

This invention relates generally to well pumping apparatus and more particularly to an improved actuating means adapted to be connected to the rod of a deep well pump.

The subject matter of the present application specifically relates to deep well pumping units of the type which are frequently provided in connection with the removal of oil and water or other liquids from a well. In such an apparatus, straight line pumping jacks are employed wherein a string of sucker rods are reciprocated by the oscillation of a walking beam pivotally carried by a Samson post, the walking beam being driven by a suitable power mechanism operating through a crank mechanism.

It is highly desirable that the reciprocatory motion of the rods connected to the deep well pump occur in a perfectly straight line vertical movement. Furthermore, the greater the depth of the well, the greater the increase in the weight of the sucker rods connected to the deep well pumping unit, thus, if a particularly deep well is being worked, enormous load variations occur during the upstroke and the downstroke of the deep well pumping unit.

According to the general principles of the present invention, means are provided whereby reciprocation of the string of sucker rods can be effected with an expenditure of less power even though the effective length of stroke of the string of sucker rods is increased. Moreover, according to the principles of the present invention, a driving mechanism of a conventional Samson post having a walking beam pivotally mounted thereon can be more effectively utilized with less wear and tear on the equipment and on the string of sucker rods through the utilization of a double stroke pumping attachment connected between the head of the walking beam and the string of sucker rods extending down into the well.

It is an object of the present invention, therefore, to provide a well pumping unit which will operate at slower speeds and which will require the expenditure of less power than has been heretofore required.

Another object of the present invention is to provide a well pumping unit which will subject the pumping equipment and particularly the well pumping unit to less wear and tear.

Yet another object of the present invention is to provide a deep well pumping apparatus wherein the string of sucker rods may be moved through a longer stroke than has been conventionally obtainable heretofore.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompanying sheet of drawings in which a preferred structural embodiment incorporating the general principles of the present as shown by way of illustrative example only.

On the drawings:

Figure 1 is an elevational view of a well pumping unit incorporating the principles of the present invention;

Figure 2 is a fragmentary end elevational view showing additional details of construction of the pumping attachment provided in accordance with the principles of the present invention; and

2

Figure 3 is a diagrammatic view of the structure demonstrating the advantageous operating characteristics of the invention.

As shown on the drawings:

5 The apparatus of the present invention is particularly suited for actuating a deep well pumping unit used for removing liquid, such as oil or water, from a well W drilled in the ground G, the usual well head being provided and indicated by the reference numeral 10.

10 The well head 10 carries a stuffing box as shown at 11 through which a polish rod 12 projects. It will be understood that one end of the polish rod 12 is connected to the uppermost sucker rod of a string of sucker rods leading to the deep well pumping unit in accordance with conventional practice.

15 According to the principles of the present invention, a platform 14 is provided on the ground G adjacent the well W and carries a Samson post indicated generally at 16 and more particularly comprising a framework 17 which is generally triangular-shaped and which has a pivotal bearing block 18 mounted at the uppermost portion thereon.

A walking beam 19 is pivotally carried by the pivotal bearing block 18 at a medial portion thereof.

20 Power means are connected to one end of the walking beam 19 to cyclically oscillate the walking beam 19 in accordance with conventional practice. The power means more particularly comprise a drive motor indicated at 20 driving a transmission apparatus 21 through a driving belt 22. The transmission apparatus 21 includes a crank wheel 23 which is suitably counterweighted by the counterweights indicated at 24. The crank wheel 23 is connected in driving relation to the walking beam 19 by means of a connecting rod 26.

25 At the other end of the walking beam 19 is provided the head member 27. The head member 27 is provided with a curved surface 28 and a flexible connecting means 29 is connected at one end to the head member 27 and arranged to depend from the head member 27 for selective engagement with the curved surface 28.

30 According to conventional practice, the flexible connecting means 29 is directly connected to the polish rod 12 so as to reciprocate the entire string of sucker rods and the pumping unit associated therewith in unison with the reciprocation of the head member 27 upon oscillation of the walking beam 19.

35 According to the principles of the present invention, however, special attaching means are provided between the rod members of the pumping unit and the head member of the walking beam. The special attaching means preferably comprise a block and tackle rig having at least a single whip so that the stroke of the pumping unit will be greater than the corresponding unison stroke of the head member 27.

40 As is illustrated in the particular structural embodiment of the drawings, the flexible connecting means 29 comprises a pair of cables each connected to a support bracket 30 on the end thereof and having a pin or axle 31 on each end mounting a sheave 32.

45 It will be understood that the term "sheave" as used in describing the member 32 is employed in a generic sense and identifies any rotatable member operable as a pulley wheel. In the illustrated embodiment, the sheave 32 takes the form of a sprocket having circumferentially spaced teeth.

50 In the illustrated embodiment, the block and tackle attachment provided includes a single whip. In other words, the pulley rope means provided for the block and tackle arrangement includes a single strand identified by the reference numeral 33 having a stationary end 34 connected to the platform 14 by the bracket connector 36

and a movable end 37 connected to the polish rod 12 by means of a suitable connector 38.

In the illustrated embodiment the strand 33 includes a double link chain, one chain being threaded over each respective sprocket 32 and engaging the teeth thereon.

By virtue of the arrangement thus provided, the polish rod 12 and the string of sucker rods attached thereto, together with the well pumping unit associated therewith will be reciprocated in unison with the oscillation of the walking beam 19 and the corresponding reciprocation of the head member 27.

In accordance with the principles of mechanics which are advantageously exploited in the present structural arrangement, it will be understood that the pin or axle 31, which can be regarded as first reference point, will be moved through a stroke "L" of predetermined length (Fig. 3). Since the length of the pulley rod means or link chain 33 remains constant, it will be appreciated that the length of the pulley rope means in the run extending from the stationary end 34 to the sheave 32 will be increased by an amount equal to the stroke "L" of the pin or axle 31 whereas the length in the pulley rope means in the run from the movable end 38 to the sheave 32 will be decreased by an amount equal to the stroke "L" of the pin or axle 31. Therefore, although the pin or axle 31 will move a distance of only one unit relative to the stationary end of the pulley rope means indicated at 34, the movable end 37 of the pulley rope means will be moved two units. In other words, for any stroke of reciprocation of the head member 27, the corresponding stroke of the well pumping unit will be greatly increased and for a block and tackle arrangement having a single whip, the amount of such increase will be approximately two times. As shown in Figure 3, the increased stroke is equal to "2L."

With an arrangement as herein described, the power means associated with the walking beam may be operated at much slower speed than has been heretofore required and because of the mechanical advantage which is effectively exploited, power requirements are actually reduced. Furthermore, the increased length of stroke minimizes wear and tear on the pumping apparatus and particularly the string of sucker rods extending down into the well to the well pumping unit.

Because of the increased stroke, it is desirable to provide increased space between the beam head 27 and the well head 10. One means of providing additional space is to raise the Samson post 16 so as to elevate the end of the beam 19 above the normal level of a conventional structure.

In order that the principles of the present invention may be conveniently practiced on existing well pumps, it is contemplated that an adaptor bracket 40 be firmly connected at one end of the beam 19, the head 27 being connected to the adaptor bracket 40 in offset relation to the normal longitudinal axis of the walking beam 19. The adaptor bracket 40 conveniently comprises a beam section connected at right angles to the axis of the walking beam 19 and extending upwardly thereof.

Although various minor structural modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications are reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A pumping unit, comprising, a walking beam, a support frame including a Samson post pivotally mounting said walking beam, a curved head member on one end of said walking beam, power means connected to the other end of said beam and oscillating said beam to alternately elevate and lower said head member throughout a stroke of predetermined length, a cable member connected to and depending from said head member and engaging the

curved portion of the head member, said cable member being alternately elevated and permitted to descend by said head member, a movable pulley block means having pulley wheel means and being connected to said cable member, said head member and said cable member positioning said movable pulley wheel means near the axis of the walking beam, pulley rope means having a stationary end connected to said support frame and a movable end trained over said pulley wheel means, and a rod for a reciprocating well pumping unit connected to the movable end of said rope means, whereby the stroke of said rod will be longer than said stroke of said head member.

2. In a deep well pumping apparatus of the type having a rod connected to a deep well pump unit, a support frame including a Samson post having a walking beam pivotally mounted thereon, a head on said walking beam having a curved surface, a flexible connecting member depending from said head and engaging said curved surface, a pulley block carried on the end of said flexible connecting member and positioned by said head and said flexible member near the axis of the walking beam and reciprocating in unison with said walking beam through a predetermined linear stroke, and a pulley rope associated with said pulley block and connected to said support frame and having a movable end adapted to be connected to the rod to reciprocate the rod in unison with said block and beam but through a linear stroke greater than said predetermined linear stroke of said pulley block.

3. In a deep well pumping apparatus of the type having a rod connected to a deep well pump unit, a support frame including a Samson post having a walking beam pivotally mounted thereon, an adapter bracket comprising a beam section connected at right angles to the axis of the walking beam at one end thereof and having the other end thereof extending upwardly of the walking beam, a head member having a curved surface and being connected to said adapter bracket in offset relation to the axis of the walking beam with said curved surface disposed above said axis of the walking beam, a flexible connecting member depending from said head and engaging said curved surface, a pulley block carried on the end of said flexible connecting member but close to the axis of the walking beam and reciprocated by said walking beam through a predetermined linear stroke, and a pulley rope associated with said pulley block and connected to said support frame and having a movable end adapted to be connected to the rod to reciprocate the rod through a linear stroke greater than said predetermined linear stroke of said pulley block.

4. A well pumping apparatus, comprising, a support frame including a Samson post, a walking beam pivotally mounted on said Samson post, an adapter bracket on one end of said beam and extending upwardly thereof, a power means connected to the other end of said walking beam to oscillate same, a head member on said adapter bracket oscillating through a stroke of predetermined length, a cable connected to said head and reciprocated vertically in unison with said head, a sheave connected to said cable and positioned thereby close to the axis of the walking beam, a link chain threaded on said sheave and having one end connected to said support frame and the other end adapted to be connected to the rod of a pumping unit, whereby the pumping unit will be reciprocated in unison with said head but through a stroke of greater length.

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