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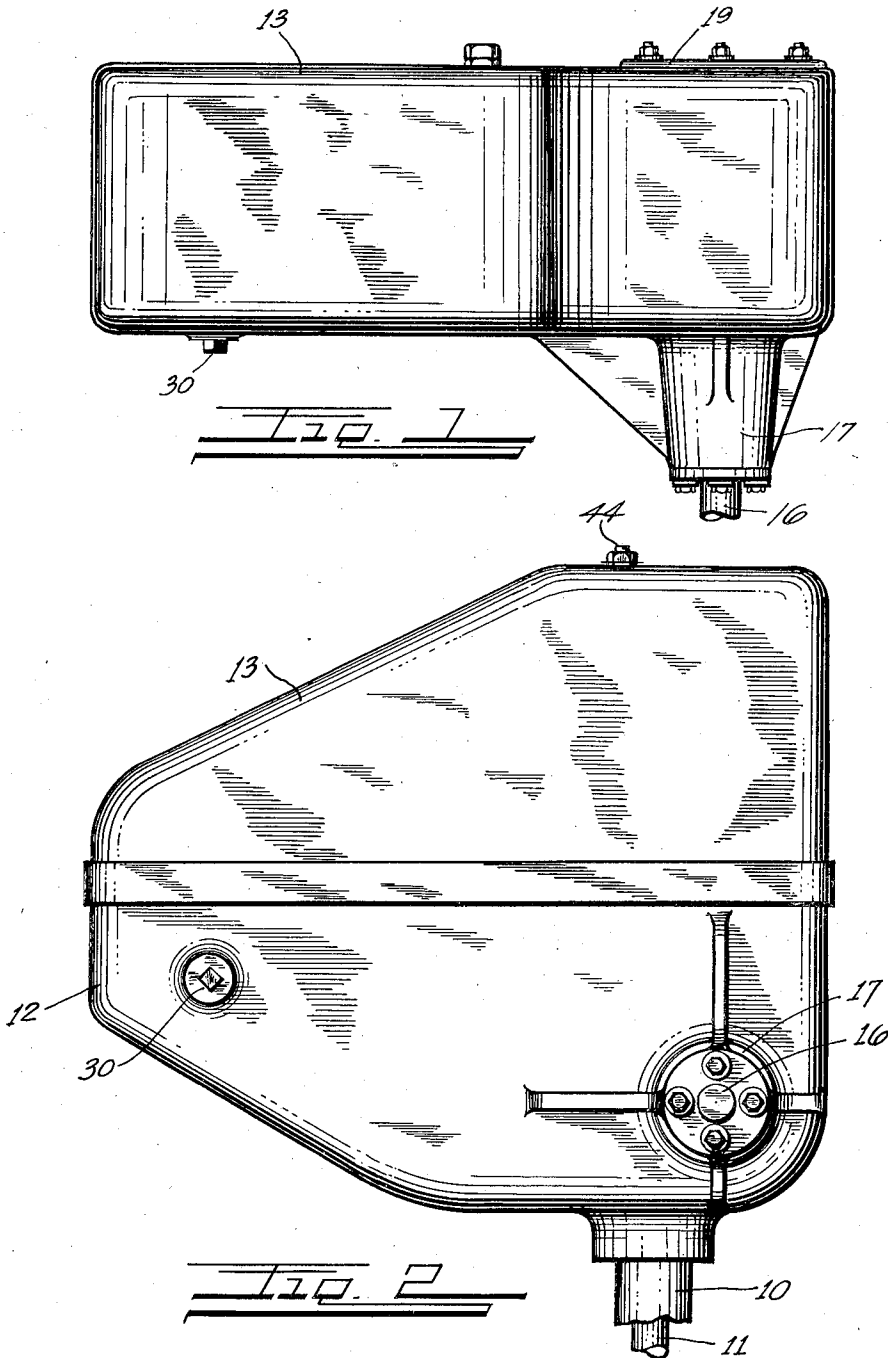
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2,197,018

PUMP JACK

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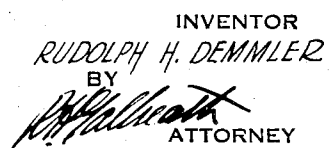
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PUMP JACK

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3 Claims. (Cl. 74—48)

This invention relates to a power transmission mechanism for pumps more particularly to a pump jack. In the usual pump jack, the motor, windmill, or other power operating device is submitted to extreme loads when lifting the pump rod and no load whatsoever when the pump rod is descending. This creates a jerky, uncertain movement and requires excessive power for use only on one-half of the revolution.

The principal object of this invention is to smooth out the demand curve so that the motor can operate against a uniform load constantly and so that the power will be stored on the down stroke of the pump rod to be used to assist the motor on the up stroke thereof.

Another object of the invention is to design a spring balanced pump jack in such a way that the leverage against which the springs act will increase in effect as the springs decrease in effect so that the resultant power delivered to the pump rod will be uniform at all positions thereof.

A further object of the invention is to construct a spring balanced pump jack in which the spring action is adjustable as to angle of application so that the action of the springs can be balanced against load conditions.

There are other advantages to be obtained from the use of this invention which is designed for simplicity, economy, and efficiency. These will become more apparent from the following detailed description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a plan view of the improved spring balanced pump jack.

Fig. 2 is a side elevation thereof.

Fig. 3 is a plan view with the cover plate removed.

Fig. 4 is a vertical, longitudinal section, taken on the line 4—4, Fig. 1.

Fig. 5 is a detail section taken on the line 5—5, Fig. 4.

The invention is preferably designed to be secured to the upper extremity of the pump casing of a well. In the drawings, the well casing is indicated at 10 and the pump rod therein at 11. The mechanism is enclosed in a gear case 12 covered by means of a suitable cover 13. The case 12 is oil tight and is maintained partially filled with lubricating oil, as indicated at 14.

The case is formed with an internal, vertical

sleeve 15 about the pump rod 11 to prevent the oil from flowing into the casing 10.

A power shaft 16 extends into the case 12 through a suitable packed outboard bearing 17. The other extremity of the shaft 16 is supported in a stop bearing 18 secured to the case 12 by means of a flange 19. A power pinion 20 is keyed or otherwise secured on the power shaft 16 and meshes with a crank gear 21 which is journaled on a stub shaft 22 within the case 12. The gear 21 carried a crank pin 23 surrounded by ball bearings 24.

The crank pin and its bearings ride in a guide slot 25 in a pumping lever 26. A bell crank 27 projects from the lever 26. The lever is mounted on a hinge shaft 28 at the point of intersection of the bell crank 27 therewith. The hinge shaft is carried in suitable bearing blocks 29 in the case and access thereto is obtained through a plug 30 in the side of the case. The other extremity of the pump lever terminates in a hook 31 which is positioned so that it may extend into the sleeve 15 where it is connected by means of a suitable pin 32 to the pump rod 11. It can be readily seen that as the gear 21 rotates, the lever 26 will be oscillated to vertically reciprocate the pump rod 11.

A pair of spring rods 33 are threaded into heads 34 which are pivotally mounted on a pivot pin 35 at each side of the bell crank lever 27. The free extremities of the rods 33 pass through an abutment arm 36 formed integrally with the case 12 and extending upwardly therefrom at an angle to position its face substantially at right angles to the axis of the rods 33.

The abutment arm 36 contains vertical slots 37 for receiving the extremities of the spring rods 33. The slots allow the angle of the rods to be changed as desired. Each rod is held at any predetermined angle by means of a washer 38 which is forced into one of a series of receiving indentations 39 in the arm 36 by means of a compressing spring 40. The springs 40 surround the rods 33 and each is compressed thereon between one of the washers 38 and a spring adjusting nut 41. The spring adjusting nut 41 is locked on the rod by means of a jam nut 42 and the rods are locked in the heads 34 by means of similar jam nuts 43.

It is desired to call particular attention to the angular placement of the spring rods 33. This placement is such as to assist the gear 21 in exact proportion as this assistance is required, and so as to deliver a uniform thrust from the springs.

Let us assume that the device is in the position

shown in Fig. 4 ready to start the "up" stroke of the pump rod 11. At this point the work is exceedingly difficult since the rod must be started upward under its weight and the weight of the water being lifted. The position of the crank pin 23 is such, however, that it obtains an advantageous leverage on the pump lever 26 as the crank pin moves from its low point. At this point the springs 40 are at their greatest compression and will exert their maximum push. They are acting, however, at an obtuse angle to the levers 27 so that they are not exerting their maximum torque on the pump lever 26. As the crank 23 rises, however, its lever arm increases and the load thereon proportionately increases. The leverage of the bell crank lever 27 has also increased since it has moved to a position at right angles to the thrust of the springs so as to deliver a maximum effect from the expansion thereof. The above construction causes resultant reaching of the springs to be uniform from the beginning of the "up" stroke, until well toward the end thereof at which time the leverage of the crank increases to take over the load.

On the down stroke, the entire motor power and the weight of the pump rod is absorbed in the compression of these springs. The device therefore acts to place a uniform load on the motor and to cut the power required substantially fifty per cent.

The series of the receiving pockets 39 allow for adjustment to the angle of the spring rods to obtain the proper effect. After the proper angle has been obtained, there is no further adjustment necessary. The abutment arm also serves to hold the cover 13 in place, there being a cap screw 44 threaded therein for this purpose. The cover is sealed to the case by means of suitable packing 45.

Any source of power may be applied to the power shaft 16, such as a windmill, gas engine, electric motor, etc.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A spring balanced power transmission unit for pumps comprising: a rotating crank member; a pump lever hinged at its one extremity so as to lie in a plan parallel to said crank member; means for attaching a pump rod to the other

extremity of said lever; a crank projecting from said crank member into a longitudinal slot in said pump lever so that rotation of the former will reciprocate the latter; means for attaching the other extremity of said lever to a pump rod; a bell crank lever projecting from said pump lever adjacent its pivot point; and a compression spring acting against said bell crank lever, said compression spring being so positioned that the angle between its axis and the axis of the bell crank lever will be substantially 90° at the time the crank pin has completed one-half of its "up" stroke.

2. A spring balanced power transmission unit for pumps comprising: a rotating crank member; a pump lever hinged at its one extremity so as to lie in a plan parallel to said crank member; means for attaching a pump rod to the other extremity of said lever; a crank projecting from said crank member into a longitudinal slot in said pump lever so that rotation of the former will reciprocate the latter; means for attaching the other extremity of said lever to a pump rod; a bell crank lever projecting from said pump lever adjacent its pivot point; a hinge pin extending through said bell crank lever; a spring rod at each side of said lever hinged on said pivot pin; an abutment member through which the other extremities of said spring rods pass; and spring surrounding each rod, said springs being compressed between said abutment member and adjusting nuts on said rods.

3. A spring balanced power transmission unit for pumps comprising: a rotating crank member; a pump lever hinged at its one extremity so as to lie in a plan parallel to said crank member; means for attaching a pump rod to the other extremity of said lever; a crank projecting from said crank member into a longitudinal slot in said pump lever so that rotation of the former will reciprocate the latter; means for attaching the other extremity of said lever to a pump rod; a bell crank lever projecting from said pump lever adjacent its pivot point; a hinge pin extending through said bell crank lever; a spring rod at each side of said lever hinged on said pivot pin; an abutment member through which the other extremities of said spring rods pass; spring surrounding each rod, said springs being compressed between said abutment member and adjusting nuts on said rods, said abutment member being provided with elongated slots for the reception of said rods to allow angular adjustment thereof; and means for holding said rods at desired positions along said slots.

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